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January 22, 1931

New York Subways

FIFTH ARTICLE

Problems Involved in Building the Sixth Avenue Line

Arch Dam Analysis Simplified

Sewer Infiltration Control at Miami

Observation Tower Design—Empire State Building

Flood Control on Alluvial Rivers

THIRD ARTICLE

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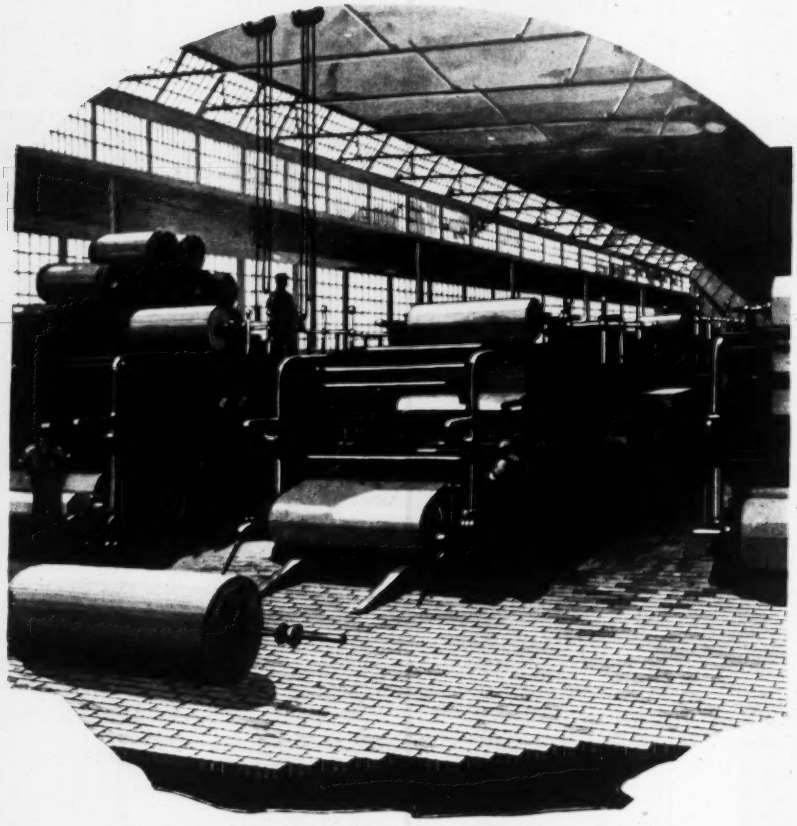

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What Has Happened to Building Costs?

A prominent building contractor reports the findings of an inquiry into cost changes over the past five years.

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Dorrco Doings in 1930

The past year has been one of liquidation and has left most of us perplexed as to the future. Many reasons have been offered for the slump in consumption, and many remedies have been suggested.

Will Rogers' proposal to kill off all the inventors who produce labor-saving inventions might help if we didn't kill off those who make new things for our happiness and benefit, and if the labor-saving inventions did not also make products cheaper so that we can use greater quantities of most of them.

An informal meeting of a group of men directing a large amount of chemical and physical Research in this country brought out the fact that this was the first major depression in which the first thought of Boards of Directors was to expand rather than curtail Research and Development.

Rhythm or cycles seem fundamental in the universe, but we are not hoping too much, I feel, to believe that with the will to work for mankind more than ever in evidence, Science — physical, economic and social — will find means to flatten out the peaks and depressions.

Fundamentals

Our development work both in finding new applications for existing processes and equipment and developing new "tools" for improving present operating methods has necessarily been largely empirical.

Our widening horizon and the insistent urge for improvement in established fields have emphasized our need of fundamental knowledge and knowing the why of things. A special laboratory for "pure" research near our testing plant at Westport and a fellowship at the Mellon Institute are answering that need.

Technical Data

A recent suggestion for a subject of Institutional Research was the "Science of the Utilization of Science."

The problem of the collection, analysis and distribution of the knowledge required for all members of an organization to function in all regards most efficiently, is by definition unsolvable. We are, however, attempting this with our Technical Data Bureau, headed by one of our older Engineers with broad experience, and a passion for facts; although we realize with the modern philosophers that "there are no such things as facts in the world, only relationships."

Field Engineering

When executives or a Board of Directors approve a requisition they may speak of buying machinery, or a process, or services, but what they really are buying or hoping to buy is Profit, whether by saving in intelligent operation or by more or better output.

Our Field Engineering Division, supervising installation and initial operation, has developed greatly in its three years of existence, and in several cases has assumed responsibility for complete units of chemical plants where our specialized knowledge and experience were vital factors.

Sanitary Engineering

Owing to the cheap money and the increasing standards of sanitation, as well as the urge to meet unemployment problems, the year 1930 has seen great activity in this field. Our pioneer work is bearing fruit, and Dorr "Mechanical Methods" are being generally utilized.

Separate Sludge Digestion, originally regarded as chiefly adapted to small town use, has been adopted with Dorr Equipment by large cities including Erie, Pa., with 400,000 and Toledo, Ohio, with 600,000 population.

The largest water softening project this year, the Mahoning Valley plant near Youngstown, Ohio, will use Dorr Mixers and Clarifiers.

Among the Metal Mines

The low price of metals has reduced mining development, but two large mills in Canada—International Nickel and Hudson Bay Mining & Smelting—have commenced operating, completely equipped with our Classifiers, Thickeners and Filters.

The world's largest acid slime-leaching plant—that of the Inspiration Copper Company, at Miami, Ariz.—was placed in operation, using Dorr Agitators and our 150' Traction Thickeners for counter-current decantation.

Cement Grinding

Our close connection with, and many contributions towards, closed-circuit grinding in metallurgical plants convinced us that a similar field should exist in wet raw cement grinding, where open circuit grinding has been the accepted practice.

It was discussed for many years, but the industry feared that a closed-circuit ground product with less very fine material would give an inferior cement.

Six months' work at Washington by a Dorr engineer in cooperation with a Government Bureau, followed by extensive test work in the field, convinced us that it was safe to make a guaranteed installation, promising twice the former output with a product of equal quality.

It was accepted after showing 138% increase in capacity, with power, steel and labor costs halved. Our client has advertised his product made with two stage closed-circuit grinding with Dorr Classifiers and a 225' Traction Thickener as "the highest quality cement in the world."

Progress

We have this year arranged for the application of rubber covering for protecting equipment against acid solutions and abrasion.

In the petroleum field, successful operation of our continuous process for the stabilization of pressure residua demonstrates that a material which formerly was regarded as waste can be turned into a product of very definite value. We have also successfully demonstrated a process for reclaiming continuously the mud used in rotary drilling operations.

An interesting new development is the Dorr Clabowl, especially designed to make a fine separation between water floated clay and sand.

The past year has brought me many changing scenes, from a bit of lime-light in New York in February at the A. I. M. E. meeting, to the banks of a Holland canal, trying to assuage the birth pains of a new and complicated chemical process going into commercial operation. But, through them all has run a feeling of understanding comradeship both with professional associates and with the "men on the job," coming off after a strenuous shift.

We are indebted to many friends who have given us their confidence and felt that our troubles were theirs, just as we have felt full responsibility for giving them 100% returns.

John V. W. Dorr

247 Park Ave., New York City

DORRCO

ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

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Where the Money Goes

TWO conditions make the story of the Sixth Avenue subway project which we describe this week exceptionally noteworthy and entitled to careful study. It is by far the most complex and difficult undertaking of the kind that has ever been attempted; the number of obstacles is so great, the work must burrow under and over existing structures in such a seemingly hopeless manner that prior underground construction is surpassed by a notable margin. Second, the increased cost of the work due to these complications is significant. It represents in sensational yet characteristic manner the truth that growing city facilities mean ever-growing unit costs. Were it possible for one generation to think ahead to the next generation's requirements some of these costs might be avoided; but this foresight is not often possible.

Safer Construction Heating

THE fire hazard of inclosing winter construction with curtains has within the last two weeks been emphasized by at least two cases of fire damage due to wind-blown canvas coming into contact with open fire heaters. Neither the present use of open fire or flame heaters nor the use of canvas housing is a credit to construction intelligence and ingenuity. The open fire heater particularly is a relic of early practice in winter construction which may well be discarded. In this detail at least, even if builders do not proceed to the full limit of complete timber inclosure, the example of the Lansing, Mich., bridge work described in *Engineering News-Record* four weeks ago (Dec. 25, 1930, p. 1004) is well worth noting. At Lansing heater units with blowers were substituted for radiators and piping systems. They got the warm air into corners. They were installed with a minimum of piping having simple connections, and gave virtually complete flexibility of location and relocation. In its heating practice this Michigan operation makes a distinct contribution to winter construction methods.

New Bidding Procedure

A NEW STEP in the development of prequalification practice has been taken by the supervisors of Westchester County, New York, in making public advertisement for submission of bidding qualifications by contractors as a preliminary to issuing invitations to bid. The advertisement, published in *Engineering News-Record* last week, is intended to limit bidding to those who would prove competent and satisfactory contractors for the county office building which is to be built. By obtaining such qualification data the county not only will reduce the waste of unnecessary bidding but it will overcome the legal objections against selection of bidders after the opening of bids. It has been held in one or two cases of federal government bidding that the specifications and call for bids set forth all the conditions to be met by the bidders, and that an attempt to apply other criteria of discrimination after the opening of bids is questionable. Under the Westchester procedure there remains no occasion for such attempt, as the selection of bidders on the basis of advance information on qualifications establishes them as acceptable. The new procedure is a promising experiment in improving contract practice.

An Empty Gesture

WITH all due respect to the first President of the United States, we believe that the Port of New York Authority has gone far afield in selecting "The George Washington Memorial Bridge" as the official name for the nearly completed structure which spans the Hudson River between 179th St., New York, and Fort Lee, N. J. More than a last-minute christening is necessary to make a true memorial. This bridge was neither conceived nor constructed for such a purpose; its connection with George Washington is limited to the double coincidence that its opening will occur at the time of the Washington bicentennial celebration and that one of the innumerable "Washington's headquarters" happens to be located near by. Additional objections to the new name are that it is too unwieldy for common usage and that there are other bridges of similar name; for example, Washington Bridge crosses the Harlem River only half a mile away. The world's largest suspension bridge deserves a name both distinctive and appropriate. "The George Washington Memorial Bridge" is neither.

The Mooring Mast Myth

CURRENT sketches depicting the city of the future reveal the remarkable virility of the contemporary imagination. In these drawings no limit is placed on the height or bulk of the buildings, and the airplanes and airships cruise in and out among the spires, landing in the streets or tying up to a convenient pinnacle. Subconsciously we want to believe in these pictures, and every opportunity to nurture our desire is seized upon. As a result, when the owners of a great building, like the Empire State Building in New York, top out their magnificent structure with a steel cage 200 ft. tall and call it a mooring mast for airships, the idea falls on fertile soil. It is always unpleasant to deflate these delightful dreams, but in all fairness to our readers who are engineers as well as emotional human beings it is necessary to stamp the Empire State story as a mooring mast myth. Apparently it is true that the base and main shaft of the mast are designed not alone for the expected wind load

but for an extra horizontal load of 100,000 lb., which serves the purpose of lending credence to the airship-mooring claim. But it is also true that the top 25 ft. of the mast, where all of the mechanism for airship mooring would have to be installed, is a simple dome framework of radial roof trusses, incapable of anchoring a large dirigible. Unless present methods of airship handling are changed radically, there is little prospect that the elevators of the Empire State Building will be crowded with returning air voyagers.

Tunnel-Lining Methods

IN TUNNEL driving *per se*, methods have been studied, applied and improved for so long a time that practice has become well standardized. Much the same methods were used in breaking the world's driving record in the Cascade tunnel in 1926 that were employed in the Rogers Pass tunnel in 1914 when that record was established. A very different situation obtains in the matter of tunnel lining, however. Witness the steady progress of recent years in developing the concrete blower and the simplification of lining forms with a resultant steadily increasing reduction of the labor required. In the Cushman No. 2 tunnel, now being built for the city of Tacoma, the desirability of elminating longitudinal construction joints was added to the usual cost incentive in simplifying forms. As a result a steel form was developed with which the concrete lining in a complete circular section of a 40-ft. length of tunnel is being placed in one continuous pour. Present-day construction efficiency is well reflected in the fact that equipment has been assembled which can place a complete circular section of tunnel lining containing 140 cu.yd. of concrete in one continuous pour.

Anniversaries

BRIDES of a month get badly peeved if the first return of the wedding date is not fittingly remembered. Worse confronts the luckless wight of a husband who at the end of the fifth year forgets his wife on that day in June which commemorates the beginning of his ball-and-chain existence. And by the time the golden wedding rolls around big doings are in order with front-page blurbs in the local paper and mayhap a picture of the original knot-tying event. These age-old customs are imitated in the anniversary dinners of technical societies, with tedious talks by the oldtimers, through which the youngsters sit—or sleep—in reverence. Magazines also like to celebrate fifty years of more or less useful existence with gilt jackets and wood-cut illustrations, possibly with some reason, for the number of journals that survive the early grueling days of meeting printers' bills is small enough to make a fifty-year success worth celebrating. Likewise a society that holds its members through wars without and internecine sniping within is entitled to its time of celebration, a moment of relaxation from the controlled and assumed dignity of the elders. But "anniversarying" can be carried to excess, and some recent invitations of younger organizations rather carry one who lacks a well-developed sense of humor to the same cynicism with which middle-aged couples view bride-of-a-month celebrations. No doubt society program-makers have a hard time attracting attendance, but let them beware overworking a good custom lest a curse be laid on all anniversaries or some bright legislator have a law passed to prohibit their celebration!

Looking Forward

HIGHWAY association activity in 1930 has been comparable with the year's remarkable record in road building. The accomplishment has not been equally great. This is not censure, but an expression of the fact that high purposes have been only partly achieved and that broad vision has been obstructed by too close attention to the detail of finding means even for continuous functioning.

The International Road Congress held in October advanced general understanding of highway problems between nation and nation, but accomplished little in establishing unity of principles and virtually nothing in advancing uniformity of practice. A month later, at the meeting of the Association of State Highway Officials the excellent pronouncement of principles of administration and finance lacked specific plans and organization to carry knowledge of its vital importance to the people and the industries dependent upon roadbuilding. Again, in December the Highway Research Board failed to realize its opportunity to provide a plan of coordinated research around which its director could rally the research interests of the highway industry. And finally, a week ago the American Road Builders Association rounded out a year's work with a record of effort devoted to overcoming internal dissension instead of increasing the growth of the art and industry.

These failures of fundamental purposes in highway association work are not without excuses which are sound, nor do they indicate that no important tasks have been carried out. In general the technique of highway design and construction has been advanced. Safer, stronger and more serviceable roads, more and better materials and equipment, and greater accumulations of recorded information have been provided by association activity. But in general the great constructive tasks have not been accomplished nor have the broad purposes of association for group expression and action been achieved.

By virtue of representing all the highway industry, the American Road Builders Association has an opportunity to perform a coordinating task of the highest usefulness. The vital element of its activities in 1930 lies in the work of coordination and cooperation it has accomplished beyond seeing to the continuation of its own group integrity and functioning. The cooperating agreements undertaken with the Association of State Highway Officials, with the Highways Research Board and with federal bureaus having a part in roadbuilding activities have been one of the association's most notable accomplishments in the last twelve months.

In the same period the association has progressed in stabilizing and systematizing its technical committee work. There was in this year's committee activities increased concentration and definition of attack by assigning staff engineers as special investigators and directors of research and factual surveys. In this development a distinct gain was apparent. As an example, the committee on grading avoided the usual broad review and concentrated thought on the single item of embankment consolidation. Another year will see a second problem of grading definitely searched out. By following out this plan, together with continual revisions of completed studies, a current literature of highway engineering can be developed that will be a constructive power to consolidate support of the association.

Cooperation and technical investigation cannot be

extended to their full possibilities, however, with a directing staff concerned in holding together loosely knit association elements in order to assure the financing of its plans. A stabilized exchequer is demanded—one not dependent from year to year on the success of an equipment exhibition or on whether an exhibition is held yearly or at longer intervals. To correct this situation the manufacturers' division, whose exhibition now finances the association, has come forward with a plan of promising character by which the association's work may be placed on a business basis. It assures annually the funds needed for association activities but leaves decision open as to holding an exhibition annually or at longer periods. The immediate consideration of this plan is the most important business of the association's directors. It should be possible to work it out in some acceptable form; the road-building industry will not easily excuse division jealousies which obstruct the task.

Passing from the internal problems of the Road Builders Association, it may be observed that not all elements of the art are provided with adequate means of expression. Many current problems of economics, design, construction and operation require discussion, but few of them find a central forum where all interested parties may assemble and cooperate in their solution. The evolution of cooperative highway thinking is not yet complete.

Modern conditions place a high premium on efficient organization of industries. Organization serves both offensively and defensively, the former in development, promotion and increase of efficiency, the latter in combating subversive forces. No present industry has greater need for these services than the highway industry. It is under attack from many sides, and its funds are being sought by real estate and tax diversion interests, while the very justification of its existence is placed in question by the railroads. It faces such rapidly growing demands on its powers that only well-organized study of better planning, design and construction can keep abreast of the increasing requirements.

Organization of the road-building industry does not imply a lessened number of independent associations; perhaps the very opposite. Research and state administration are not the only working units of the art entitled to consideration; contracting, equipment and operation are no less important and can benefit by similar organization. Coordination of effort and working harmony of the single units are vital in any event. If the single units of the industry can be knit together and brought into mutually supporting relation, a satisfactory beginning will have been made in adapting the industry to what the future will require of it.

Greater need never existed for a united industry to direct public roads improvement. A federation of highway interests is the most trenchant weapon that the time affords to protect and advance highway improvement. This federation is possible through extension of the coordination and cooperation which has been so well begun this year. If it remains unprovided because of narrow group attitudes and inability to think and plan industry-wide action, highway associations will have failed in their principal task.

Current progress of the road-building field is at present without the stabilizing support of an efficiently organized industry. Road building is farther advanced as an art than it is as an organized, articulated activity. Its chief present possibility of improvement, therefore, lies in creating a stronger more coherent industrial structure.

Architects and Engineers

SETTLEMENT of the differences which have caused friction between the architectural and engineering professions for many months is in prospect. A joint committee made up of representatives of the national societies of both professions, after having gone over the subjects at issue point by point, has submitted a report to these several societies giving its conclusions on the principal subjects of controversy. Agreement was reached on every major point. If the principles laid down by the joint committee can be put into practice, little will be left to be a continuing source of friction.

Both sides have made concessions. The architects concede that the two professions overlap widely and must continue to overlap, hence no further attempt should be made on their part to obtain the enactment of laws which attempt to put all building into two classes, one class to be ranked under architecture and the other under engineering. According to the principles laid down, either architect or engineer may act as agent for the owner, the engineer enlisting architectural assistance where necessary and the architect likewise enlisting the aid of engineers where engineering beyond his own knowledge is involved. If put into effect in New York State this finding will end the controversy over the multiple dwelling law, an outstanding example of a law attempting to debar engineers from a field of activity in which they have practiced in the past.

The engineers on their part have made this concession possible by subscribing to the view, long held by some of their own number as well as by the architectural profession, that only engineers competent in structural design should have unrestricted right to practice in the field where the two professions overlap. In this instance, as the controversy centers around writing a definition of the engineer who may stand on a par with architects in all laws designed to promote safe building construction, the joint committee recommends that a subdivision of professional engineers be established to be known as "professional engineer (structural)." Engineers in this subdivision may be civil, mechanical, electrical or chemical, it matters not so long as they have the fundamental structural training.

Similarly the committee has endeavored to present a practical solution of the other points at issue between the two professions. Its findings are now in the hands of the national societies for action and for transmittal to their local sections, where abstract findings must be put into concrete form if the joint committee's work is to be crowned with success. That there will be opposition to putting its recommendations into effect is to be expected. It will come chiefly from those engineers and architects who do not feel that the time for compromise has arrived, men who persist in believing that they can obtain their ends by legislative action. Sincere as they may be, they forget that such action can only aggravate an already bad situation. By holding out against compromise they are playing into the hands of professional troublemakers.

Whether opposition will nullify the work of the joint committee the next few months will tell. That period is going to mark a time of testing for both professions. Either they will join hands and work together for mutual benefit and for safer building construction or they will lose all sight of the general good in continuing the jurisdictional dispute which has prevailed for more than a year to the discredit of all.

New York Subways—V

Problems in Building Sixth Avenue Line

Existing elevated line, subways and Hudson & Manhattan tubes will make construction of route between Eighth and 53rd Sts. the most difficult in the history of New York rapid transit

THE SIXTH AVE. ELEVATED LINE, much of it already supported by underground structures that will have to be further underpinned and altered, three existing subways crossing the new line, the Hudson & Manhattan railroad tubes and terminal station occupying the avenue south of 32d St., deep open cuts in rock of doubtful stability and the usual congestion of utilities, street railways and street traffic, all combine to make the construction of the proposed Sixth Ave. subway a most difficult task. A long, unsuccessful fight has been waged to have the elevated removed prior to subway construction in view of serious difficulties and tremendous expense involved in maintaining the line, which will ultimately be replaced by the Sixth and Eighth Ave. subway lines. A presentation of the problems and difficulties that will be encountered in building the Sixth Ave. line is timely in this series of articles on New York subway construction. Previous articles in the series have appeared Aug. 7, 1930, p. 200; Sept. 4, 1930, p. 371; Sept. 18, 1930, p. 455 and Nov. 20, 1930, p. 796. —EDITOR.

THE BUILDING of the Sixth Ave. route, the last link of the Manhattan lines of New York's city-owned independent subway system as planned in 1925, will be the most difficult piece of construction ever attempted in the city's long history of underground railroad work. Extending from the junction of the Eighth Ave. line at Greenwich Ave. and Eighth St. north to the new crosstown line at 53d St., the new four-track route will pass under, over and through a maze of existing underground and surface structures, the protection of which constitutes a most serious engineering problem. To get by existing structures the four tracks weave and twist, sometimes being adjacent on one level, again entering a two-level double-track box, and yet again separating into three lines at three different levels. From Nineteenth St. to 30th St. the two express tracks are in a double-track rock tunnel, the local track being in separate open-cut boxes at varying levels. A map of the most important part of the route showing existing lines and stations is shown in Fig. 1.

This article considers only that portion of the line between Eighteenth and 53d Sts. Plans for this section are fairly complete.

Existing Facilities Complicate Work

A maximum open-cut depth of trench is reached at Eighteenth St., where the subway grade is 62 ft. below street surface. Along the rest of the route the cut averages 45 ft. deep below street grade. The rock elevation varies, but in general lies from 20 ft. below the street at 53d St. to 32 ft. deep at Eighteenth St. Rock cuts, while advantageous to most subway work, will be a constant menace on the Sixth Ave. line because of the character of material and inclination of the strata. The rock is a seamy Manhattan schist, lying in inclined planes parallel to the center line of the subway. There will be constant hazard of rock sliding into the cut, a danger not only to the subway structure itself during construction but to the foundations of adjacent buildings and other structures. Groundwater elevations vary from 5 to 10 ft. above the rock line.

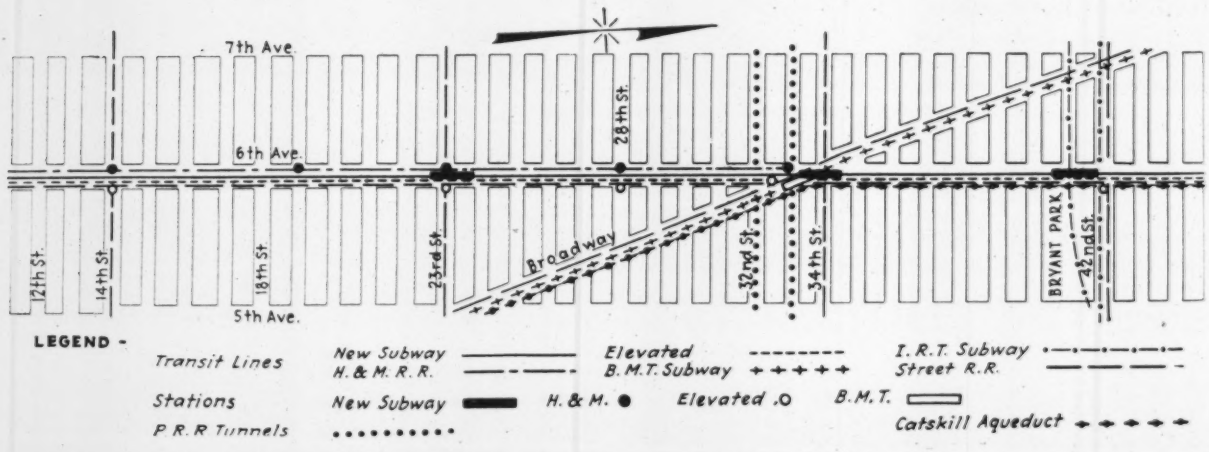


Fig. 1—Map of Sixth Ave. subway route showing existing lines and stations

Of all the structures now existing along the route of the new subway, the one demanding the most attention will be the Sixth Ave. elevated line. This is a two-track structure with numerous stations, extending the full length of the avenue over the subway line. Considerable effort was made by the board of transportation to have the elevated removed prior to starting the subway construction, as the subway is intended to replace the elevated and a serious construction problem would be eliminated by having the overhead structure out of the way. But the Interborough Rapid Transit Co., operating the elevated, insisted that its removal at this time would throw the company into bankruptcy, a possibility for which the board of transportation did not wish to assume responsibility.

Elevated Railway Retained

The Board of Transportation estimates that having the elevated in place will increase the cost of the subway construction by $6,000,000, of which $3,000,000 will go directly into underpinning the elevated line and the other $3,000,000 will be chargeable to the delays and inconvenience experienced during the construction.

The elevated line is carried on two rows of columns centered transversely on the center line of street 23½ ft. on centers, the bents spaced longitudinally about 43 ft. Subways have frequently been built under existing elevated lines, but the extreme depth of cut, possibilities of rock slides and the fact that many of the elevated columns are already being carried on structures that will have to be further underpinned make the handling of the elevated on the Sixth Ave. work a very difficult operation.

However, the elevated line is but one of many existing structures that will have to be taken care of or add to the difficulties of the subway construction. The main Catskill aqueduct of the city's water supply runs under Sixth Ave. as far south as 33d St. at a depth of 200 ft. below the surface and 400 ft. below hydraulic gradient. Question has been raised as to the possible effect on the aqueduct of unloading a wide trench of rock 40 to 50 ft. deep directly over the conduit. At 41st St. in Bryant Park, on the east line of subway, there exists an aqueduct shaft extending nearly to the surface under full head. The subway structure cuts through the underground gate house of this shaft (Fig. 3).

The four-track one-level line of the Brooklyn-Manhattan Transit subway lies close to the surface under Broadway, crossing Sixth Ave. diagonally at 32d and 33d Sts., with a station for both express and local service at 33d St. (Fig. 4). At 32d St., also close to the surface, is the terminal station of the Hudson & Manhattan Railroad, which runs underground up Sixth Ave. from Ninth St. The railroad for this distance consists of two tracks in a single box structure, terminating in three tracks under the 32d St. station. The two express tracks of the new subway line will be directly under the H.&M. tracks from 29th to about Nineteenth St., being in tunnel part of the way and in an open-cut box for the remainder of the distance. Both local subway tracks are, for the greater part of the distance, alongside the H.&M. structure in independent boxes at varying levels (Fig. 5). Besides the terminal station, the H.&M. has stations on Sixth Ave. at 28th, 23d, Nineteenth and Fourteenth Sts. Elevated columns between 32d and Ninth Sts. rest on top of the H.&M. box, which complicates the underpinning of the H.&M. line in the deep open-cut sections.

Cross-Town Subway

Besides the H.&M. and B.-M.T. lines, there are four other underground railroads to cross, two in the congested zone just south of 33d St. The I.R.T. Times Square-Grand Central shuttle is crossed at 42d St., the new subway passing under the existing line. At 41st

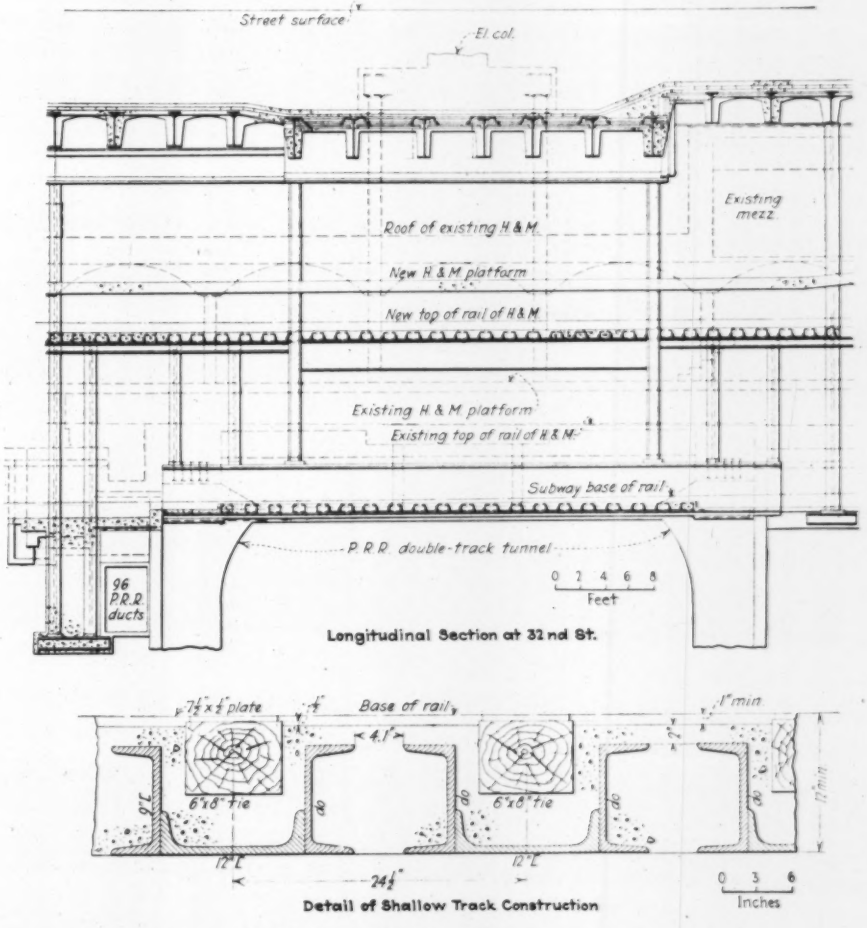


Fig. 2—Longitudinal section of subway at 32nd St.

Light dotted lines show portions of existing H.&M. terminal station to be removed. Details of special shallow-track construction through the roofs of P.R.R. tunnels are shown.

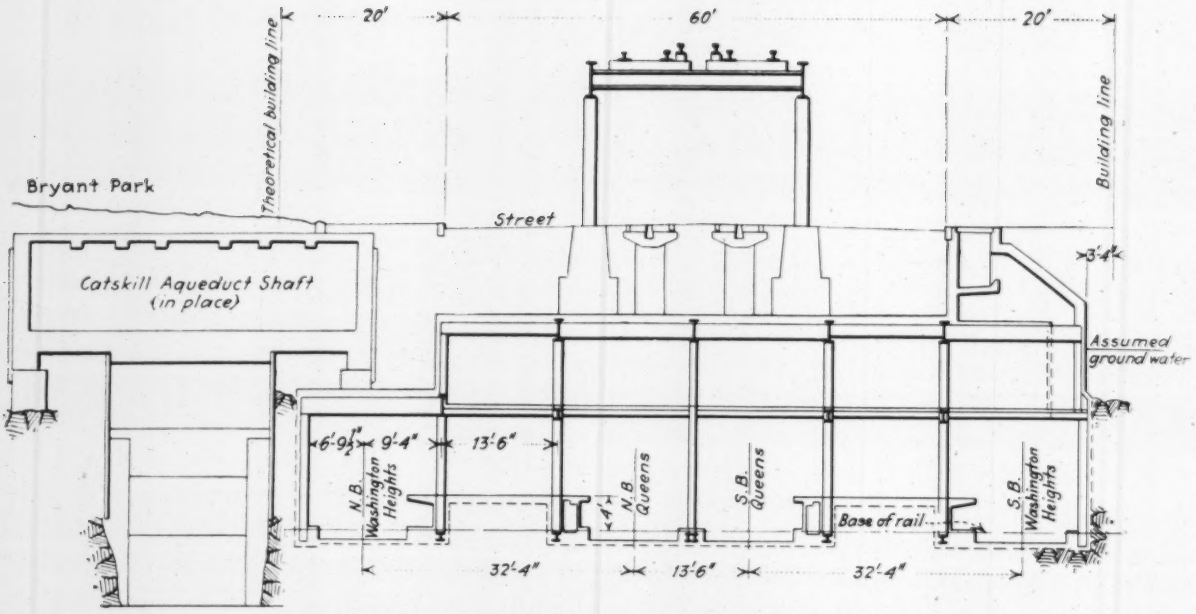


Fig. 3—Cross-section of Sixth Ave. subway line at 41st St. station

Subway structure at this point cuts through gate chamber of Catskill aqueduct shaft. Relative position of elevated railroad line and street-car supports is shown.

St. the Sixth Ave. line passes over the Queensboro subway line of the I.R.T. At 33d St. and again at 32d the new subway passes over double-track crosstown tunnels of the Pennsylvania Railroad. To squeeze the subway line between the floor of the H.&M. structure and the top of the P.R.R. tunnels will require the cutting away of the railroad tunnel roofs and the use of special shallow floor construction for the subway and will also involve the raising of the H.&M. tracks.

An accompanying table shows the existing structures in relation to the new subway.

A double-track street-car line extends the full length of Sixth Ave. Consideration is being given to replacing the street cars with buses for the duration of the subway construction, which would simplify the street decking. Crosstown street-car lines are encountered at 42d, Broadway, 34th, 23d, Fourteenth and Ninth Sts.

Many of the buildings fronting on Sixth Ave. will have to be underpinned. Others, even though founded on rock, will require protection because of the possibility of the rock sliding into the deep cuts. The region around 34th and Broadway is an important shopping

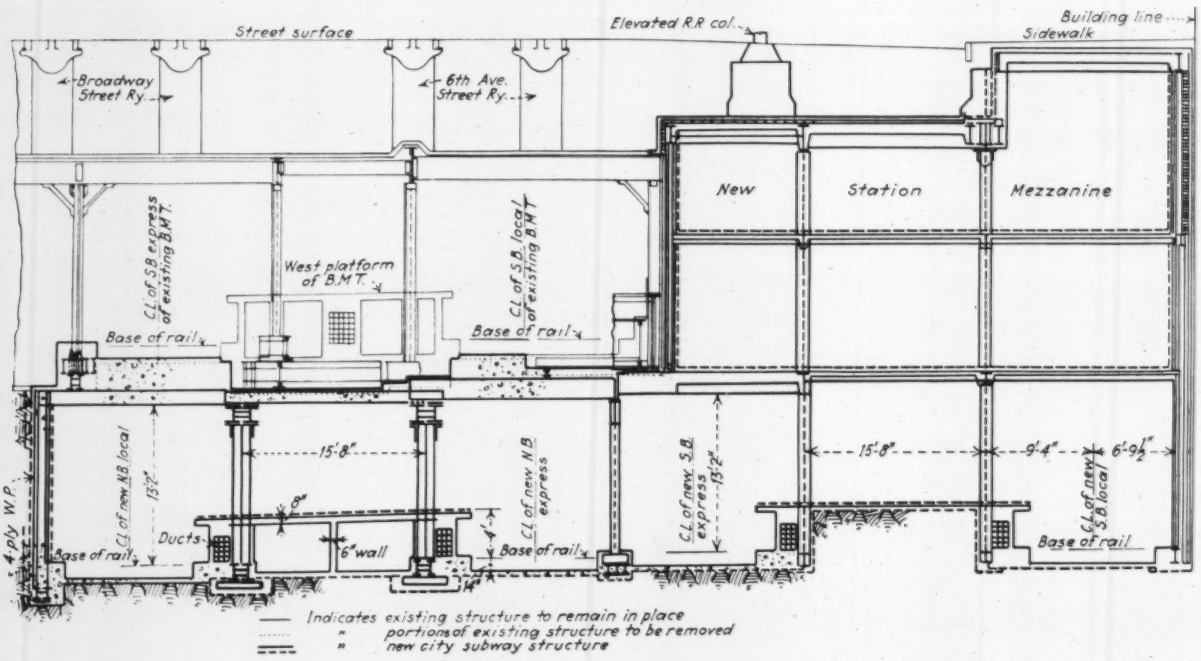


Fig. 4—Cross-section of new subway just north of 33d St.

The 34th St. station of the new subway lies directly beneath the existing B.-M.T. station. The B.-M.T. line is in Broadway, which crosses Sixth Ave diagonally.

EXISTING STRUCTURES ON SIXTH AVE. SUBWAY LINE

Structure	Location	Relation of New Subway to Existing Structure
Catskill Aqueduct	6th Ave. north of 33d	Over
Catskill Aqueduct shaft	41st and 6th Ave.	Through gate chamber
I. R. T. shuttle	42d St.	Under
I. R. T.-Queensboro	41st St.	Over
Elevated line	6th Ave.	Under
Elevated station	50-42-33-28-23-18-14-8 Sts.	Under
B.-M. T. subway	Broadway, 33-32 St.	Under
B.-M. T. subway station	Broadway-33d St.	Under
H. & M. terminal station	32d St.	Under
H. & M. R.R.	6th Ave., 9th-32d	Under and alongside
H. & M. local station	28-23-19-14th Sts.	Under and alongside
Penn. R.R. tunnels	33d and 32d Sts.	Over
Street Railway	On 6th Ave., also crossing at 42, 34, 23, 14 and 9th Sts.	Under

center. In spite of the complicated subway construction at this point the work will have to be carried on in such manner as to cause as little inconvenience as possible to the patrons of several large department stores.

New Subway

Except for connections at the north end, the line consists of four tracks, two express and two local. The long-established policy of having no subway tracks cross at grade makes a complicated track layout in the connection between the Sixth Ave. line and the new 53d St. crosstown line, the latter consisting of four tracks west of Sixth Ave. and two tracks east of the junction. Two tracks lead from the Sixth Ave. line to a stub terminal station just north of 53d St. Turnouts from Sixth Ave. both east and west into 53d St. are two-track double-deck lines, those going east designated as Queensboro tubes and those going west designated as the Washington Heights line. The farthest north station on Sixth Ave., between 47th and 50th Sts., is a double-deck structure, with the two Queensboro tracks on the east side and the two Washington Heights tracks on the west side, served by single island platforms.

Before reaching the next station, between 40th and 42d Sts., the four tracks come to one level, the Washington Heights track being on the outside and the Queensboro line tracks in the center. The station has two island platforms. Continuing south, all tracks enter and leave the next station, between 33d and 35th Sts., at one level. By this time the tracks have lost their identity as Washington Heights and Queensboro lines, the former on the outside becoming local tracks and the latter, in the center, being designated as express tracks. The 34th St. station, served by two island platforms, lies directly under the B.-M.T. tracks and station, which cross diagonally.

Conditions at 34th Street

The south end of the 34th St. station enters upon the space occupied by the existing H.&M. terminal. To provide room for the new subway station the H.&M. station and platform are to be moved 175 ft. to the south. Mezzanines for the new subway station are fitted around the outside of and at the same level as the existing B.-M.T. mezzanines. At present there is insufficient clearance between the tops of the Pennsylvania Railroad crosstown tunnels at 32d and 33d Sts. and the H.&M. tracks for the new subway. The subway floor, of special shallow construction, will run through the roof of the tunnel. To gain additional clearance the three H.&M. tracks and platforms in the terminal are

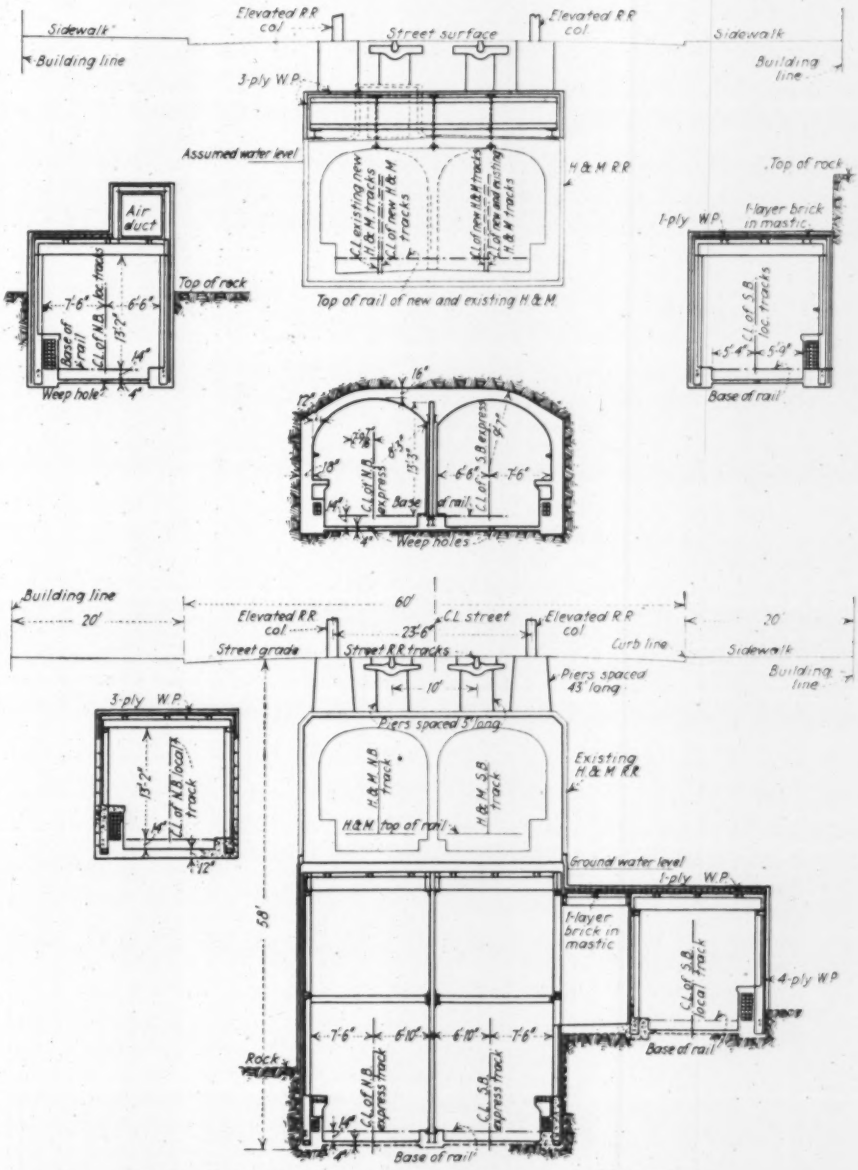


Fig. 5—Two cross-sections of Sixth Ave. subway and H.&M. tubes

Upper—Section near 30th St. showing two express subway tracks in deep rock tunnel. The H.&M. structure is to be altered as shown. Local subway tracks are in separate structures at side of tubes. Lower—Section at Eighteenth St., where express tracks emerge from tunnel into deep open cut.

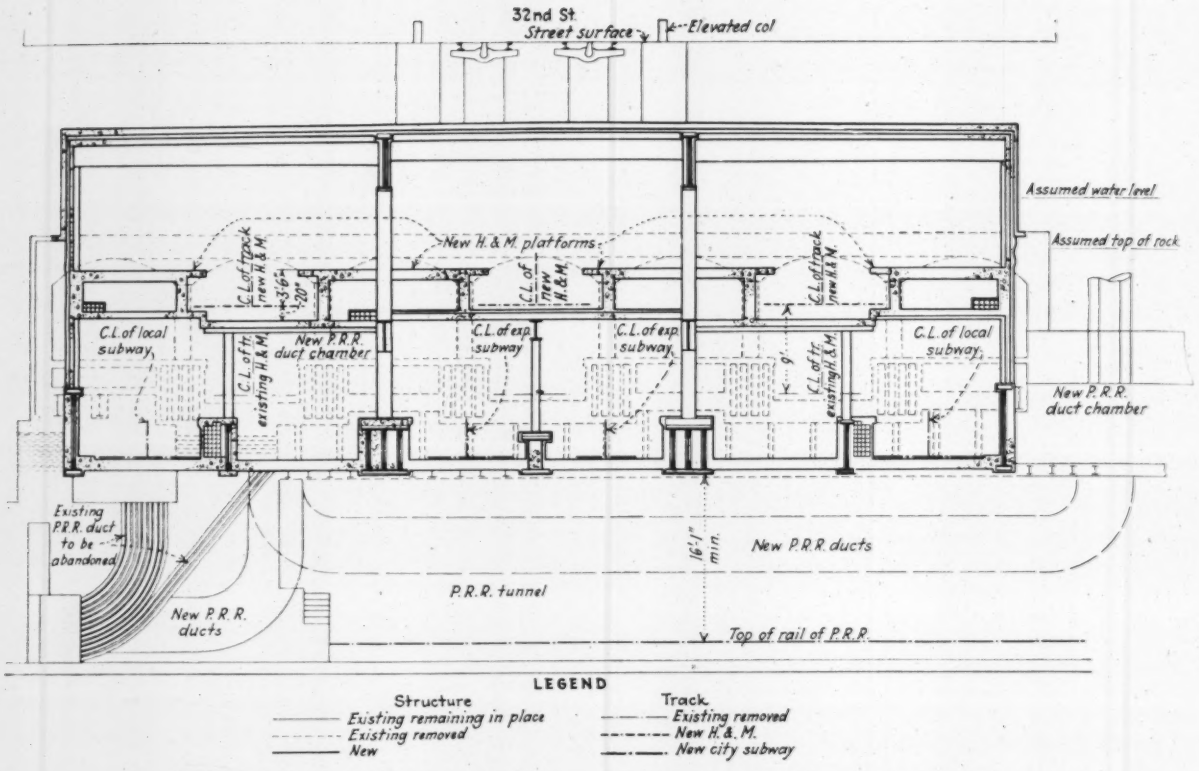


Fig. 6—Cross-section at 32d St., showing changes necessary to H.&M. terminal station

Entire H.&M. station will be altered and tracks and platforms raised a maximum of 9 ft. Roof of P.R.R. tunnel will be cut away to provide clearance for subway line.

to be raised a maximum of 9 ft., the tracks taking off existing grade about midway between 30th and 31st Sts. (Figs. 3 and 6).

Relation to the Hudson Tubes

Just south of 31st St. the grades of the new subway local and express tracks separate, the express tracks going down beneath the H.&M. tracks and the locals separating into two separate boxes, one on each side of the H.&M. box. At 30th St. the express subway tracks enter a tunnel, which continues southward to Nineteenth St. In this distance the local subway lines stay alongside the H.&M. structure, varying in elevation. They pass to the outside of existing H.&M. stations at 28th, 19th and 23d Sts. Two separate local subway stations, one for each track, with side platforms, are located at 23d St., outside the H.&M. station.

At Nineteenth St., the south end of the subway tunnel, the express tracks emerge into a deep open cut directly under the H.&M. lines. At this point the southbound local track has dropped down to almost the level of the express track, while the northbound local track is higher up, alongside and at the same level as the H.&M. tracks. Final plans have not yet been determined upon for the subway south of Eighteenth St.

The subway is part of the system now under construction by the board of transportation. Robert Ridgway is chief engineer of the board. John R. Slattery, deputy chief engineer in charge of construction will supervise the building of the new line. Design is under A. J. Raisman, chief designing engineer, and C. E. Conover, division engineer of designs. The Sixth Ave. line comes under the first division, J. O. Shipman, division engineer. C. E. Thomson, assistant division engineer, will have direct charge of the work.

Lessons of the Italian Earthquake

Observations made by John R. Freeman in a tour of inspection of the damage wrought by the Italian earthquake of July 23, 1930, are summarized by him in a paper in the December, 1930, *Bulletin* of the Seismological Society of America. He outlines the zone of extensive damage as an area about 10x40 miles along the crest of the Apennines, 50 miles east of Naples, extending northwestward from the city of Melfi to Ariano and Montecalvo, and involving ten villages and small cities. The loss of life is put at 1,500; no estimate of property loss is given. In severity the earthquake was very like that of 1857, which affected a similar area a few miles southeast of the one mentioned. From a study of long-time earthquake records for Italy, Mr. Freeman estimates that the chance of sever damage to any one mountain community in that country in any particular year is about one in five hundred. In his opinion the damage resulted largely from use of weak, heavy walls of poorly shaped stone, lacking bond, and laid in weak lime mortar made with earth rather than good river sand. Long-span floor arches and roofs made of tile laid on fir poles were common. He believes that well-built masonry laid in good cement mortar, adequate beams to carry floors and roofs, and tierods to resist arch thrust, would have prevented most of the damage.

Arch Dam Analysis by Trial Loads Simplified

A summary of the essential steps of the procedure for determining stresses in dams where vertical and horizontal resistances are jointly in action

By H. M. WESTERGAARD

Professor of Theoretical and Applied Mechanics at the University of Illinois, and Consulting Engineer to the U. S. Bureau of Reclamation

WITH increasing height of dams, especially where they are built in narrow rock canyons and where arch form is used, the simple action of gravity dams is seriously disturbed by horizontal load transfer to the canyon walls. The problem of analyzing this action so that safe and efficient structures may be built is highly complex and has been extensively discussed in the past half-dozen years. A successful method was developed by the engineers of the Bureau of Reclamation, known as the trial-load method. In its recently perfected form it has been used in the design of both arch and curved gravity structures, the Gibson, Owyhee, Stewart Mountain and Boulder Canyon dams among others.

Professor Westergaard, restudying the method for the bureau, has for the first time expressed it in a form permitting it to be readily grasped. His memorandum to the bureau, which was also presented in a paper before the International Congress for Applied Mechanics at Stockholm, August, 1930, is here given substantially in full, with some essential revisions by the author. —EDITOR.

HIGH concrete-arch dams are thick structures, to which the assumption of linear distribution of the stresses through the thickness of the structure does not apply. Yet it is expedient to approach the problem by adopting this assumption temporarily, with the idea of making corrections later for the non-linear distribution. That is, the dam is treated as if it were a shell. The methods of analysis now appearing to be most effective are based on gradual approach by trial. They require a guess or estimate of certain functions representing loads; these trial loads are then modified so that finally the conditions of geometrical continuity are satisfied.

For the purpose of the structural analysis the dam is considered to be replaced by a system of horizontal arches and a system of vertical cantilevers. Each arch or cantilever extends through the whole thickness of the dam. Each arch and each cantilever may deform independently of the remaining arches and cantilevers.

Radial Adjustment

In the first stage of the approach toward a solution, the vertical component of the water load is assigned to the cantilevers, and the horizontal component of the water load is divided by trial into two components, both radial, one acting on the arches and the other on the cantilevers. The desired division of the load is the one giving the arches and the cantilevers a certain common component of deflection at each point, this component being measured at each point in the radial direction toward the center of the arch. This method was applied successfully to systems of arches and cantilevers by C. H. Howell, A. C. Jaquith, and Julian Hinds (then at the United States Bureau of Reclamation). The process has been improved since at the Bureau of Reclamation, especially by R. E. Glover and R. S. Lieurance, who introduced certain patterns of loads, the effects of which are combined conveniently, and who systematized the work so that it can be done quickly. The deflections are determined according to the elementary theory of flexure of beams or arches with the contributions from the transverse shears included. The deformations of the foundation may be computed approximately by formulas due to Fredrik Vogt. Since this process establishes agreement between the radial deflections of the arches and cantilevers, it is referred to as *radial adjustment*.

General Principles for Further Adjustments

In the first stage of the approach, as described, the following influences were ignored: twisting moments in the horizontal and vertical sections; tangential shearing forces in horizontal sections, and the corresponding vertical shearing stresses in the radial sections; and Poisson's ratio. In the later stages of the analysis these influences must be introduced either one by one or collectively. It is to the credit of R. E. Glover in particular to have carried through, at the Bureau of Reclamation, analyses in which the twisting moments and the tangential shears are considered. To the radial adjustments there are added, then, *adjustments for twists* and *tangential adjustments* (adjustments for shears).

Two principles are applied: (1) At any point there may be introduced two equal and opposite forces or two equal and opposite couples, one of the forces or couples acting on a cantilever and the other on an arch or on the adjacent cantilever. (2) A set of coplanar couples smoothly distributed along the length of a piece may be replaced by a set of distributed forces combined with two concentrated forces at the ends of the piece. By use of these two principles, new self-balancing loads may be added to the loads already applied. These new loads must be applied and distributed in such a manner that not only the relative radial deflections but the relative rotations and tangential deflections of arches and cantilevers are removed.

As a result of the radial adjustment, cross-sections of the arches will have rotated about vertical axes relative

to the corresponding cross-sections of the cantilevers. These relative rotations are computed with due consideration of the rotation of the base of each cantilever by the bending action of the arch which abuts on this same area of rock. Loads are now to be introduced which are capable of changing the relative rotations; these loads will be called *twist loads*. The desired set of twist loads is one which removes the relative rotations.

There are introduced as twist loads: first, a load distributed over a vertical area, consisting of couples in horizontal planes, acting on the arches; second, an equal and opposite load acting on the cantilevers; third, at the top of the dam, acting on the cantilevers only, a self-balancing load consisting of couples in a horizontal plane, distributed over the top, and the equivalent set of forces reversed, the couples acting to twist the cantilevers and the forces to bend them. The loads thus introduced, both those distributed over the area (function of two variables) and those distributed over the top (function of one variable) are to be guessed or estimated and gradually adjusted by trial. Some further loads are applied, which, however, are not estimated but are computed from those already introduced. These loads are vertical forces acting on the sides of the cantilevers. They do not contribute to the twisting moments in the cantilevers, which, therefore, may be computed from the couples which have been introduced, by summation from the top down to the particular section considered. It is desired that the twisting moments in the horizontal cross-sections of the cantilevers shall be represented by shearing stresses parallel to the middle surface of the dam. There are required, then, vertical shearing stresses in the sides of the cantilevers equal to the horizontal shearing stresses, and these vertical shearing stresses are introduced as a fourth and final group of twist loads.

The forces thus applied to the two adjacent cantilevers in the boundary plane between them are equal and opposite (in accordance with the first of the two general principles stated). The forces acting on the two sides of the same cantilever, however, may differ slightly. The essential effect of this difference is bending of the cantilevers; the corresponding deflections are added to those due to the other causes.

In determining the desired set of twist loads by trial, the work is shortened, as in the case of the radial adjustment, by use of suitable patterns of loads, the effects of which may be combined conveniently.

The twist loads bend both the arches and the cantilevers and thus disturb the agreement that was obtained between the radial deflections by the radial adjustment. The adjustment for twists, therefore, is followed by a supplementary radial adjustment in which the twist loads are retained either unchanged, or changed by multiplication by a constant ratio less than one.

Tangential Adjustment

The radial adjustment, or the radial adjustment followed by the adjustment for twists with the supplementary radial adjustment, leaves points of the center lines of the arches deflected tangentially relative to the corresponding points of the cantilevers. These relative deflections are computed again with due consideration of the movements of the abutments of the cantilevers. Loads are introduced which are capable of changing the relative tangential deflections. These loads will be called shear loads. The desired set of shear loads is one which removes the relative tangential deflections.

There are introduced as shear loads: first, a set of forces acting on the arches along the tangents to the center lines; second, an equal and opposite set of forces acting on the cantilevers. These sets of forces (one function of two coordinates) are to be guessed or estimated, and adjusted by trial. Some further loads are applied to eliminate twist and lateral bending effects, which loads are computed from those already introduced. They are vertical forces acting on the sides of the cantilevers and two equal and opposite sets of couples in horizontal planes, one set acting on the arches and the other on the cantilevers. These loads do not contribute to the total tangential shearing forces in the horizontal sections of the cantilevers; these shearing forces may therefore be computed from the forces introduced first, by summation from the top down to each section.

As in the case of the twist loads, the vertical forces applied to two adjacent cantilevers in the boundary plane between them are equal and opposite, but the forces acting on the two sides of the same cantilever may differ slightly. This difference causes bending of the cantilever (since its center line is not vertical) and compression.

Since the shear loads, like the twist loads, bend both arches and cantilevers, they will disturb the agreement obtained previously between the radial deflections. The tangential adjustment, like the adjustment for twists, should be followed by a supplementary radial adjustment, in which the shear loads are retained either unchanged, or changed by multiplication by a constant ratio less than one.

Influence of Poisson's Ratio

The following two influences of Poisson's ratio have been ignored so far: (1) The changes of curvature of the center line of an arch at a given point is influenced through Poisson's ratio by the bending moment in the cantilever at the same point and likewise the change of curvature of the cantilever is influenced by the bending moment in the arch. (2) The shortening of the center line of the arch at a given point is influenced by the vertical stress in the cantilever at the same point (the stress resulting from the variation of vertical shear), and likewise the shortening of the center line of the cantilever is influenced by the thrust in the arch.

It is probably legitimate to ignore altogether effect 2, but consideration should be given to the effect 1.

A check on the results of the calculation may be obtained by comparing the work of the water pressures and the energy of deformation (including the energy stored in the foundation). The two should be equal, but on account of unavoidable inaccuracies in the process of adjustment the ratio of external work to internal energy may differ slightly from unity. If all the stresses and deformations be then multiplied by this ratio, the internal energy will be increased by its square; this correction establishes the desired equality of work and energy.

Convergence of Adjustments

Experience with the method as applying to dams indicates that a convergence toward the true solution is obtainable by a series of successive adjustments such as those described. If we denote the radial adjustments by R, the twist adjustments by T, the tangential or shear adjustments by S, and the correction by use of energy of deformation by E, the following successions have been used:

(1) Owyhee Dam, Oregon (about 400 ft. high): R_1; S_1 and T_1 independently; R_2.

(2) Gibson Dam, Montana (about 200 ft. high): R_1; S_1R_2; T_1R_3; E.

(3) One of the tentative designs for Boulder Canyon dam (about 700 ft. high): R_1; T_1R_2; S_1R_3.

Check by Tests—In the case of the Gibson Dam there are available the results of two series of tests with a concrete model of the dam, 34.5 in. high, in which the liquid pressures were applied by mercury. The tests were made in a laboratory of the University of Colorado. After the series of adjustments mentioned, without consideration of the direct influence of Poisson's ratio on the bending of arches and cantilevers, the analysis led to values of the significant deflections, which were about 3 per cent larger than those obtained in the tests. This agreement is considered satisfactory.

Since the action of the structure can be defined in terms of two functions of two variables (for example, the functions representing the radial and the tangential deflections) it should be possible to modify the process so that only two functions of two variables need be estimated. One possibility of this sort, though by no means the only one, is the following:

Estimate a set of radial loads to be applied to the arches and the set of tangential forces to be introduced with the shear loads (two functions of two variables). Revise the definition of the systems of shear loads and twist loads so that it will be permitted to introduce unbalanced radial forces bending the arches and cantilevers; that is, a radial force may be applied to an arch without accompanying it by an equal, opposite, and collinear force on the intersecting cantilever. According to this revised rule, the systems of shear loads and twist loads shall now be supplemented each by a set of radial forces acting on the arches, so that each modified system of shear loads or twist loads will cause the points of the center lines of the arches to deflect tangentially only; these additional radial loads are determined very easily when the other component parts of the system of shear loads or twist loads are known. Next, compute the twist loads which must be applied to the cantilevers in order to make the rotations of the cross-sections of the cantilevers conform to the rotations of the tangents to the center lines of the arches. Subtract the sum of all the radial loads introduced so far at each point from the horizontal component of the water pressure, and apply the resultant difference to the cantilevers. The process of adjusting the two estimated sets of loads is to be continued until fair agreements have been established between the radial deflections, as well as the tangential deflections of the arches and cantilevers.

Instead of replacing the arch dam by a system of arches and a system of cantilevers, one may replace it by three systems of structural elements, each system occupying the whole volume of the dam. The new system introduced, in addition to the arches and the cantilevers will have the primary purpose of resisting the twisting moments in horizontal and vertical sections, and will be called *the twisted structure*. The cantilevers, then, like the arches, may be considered to have no torsional resistance; the twisting moments are assigned to the twisted structure in carrying forward the computations.

The twisted structure may be conceived of as being made up of blocks which are essentially rectangular and which are hinged together at the corners. The twisted structure will not necessarily change the numerical computations, but it leads to a new method of thinking about and visualizing the structural action of the dam.

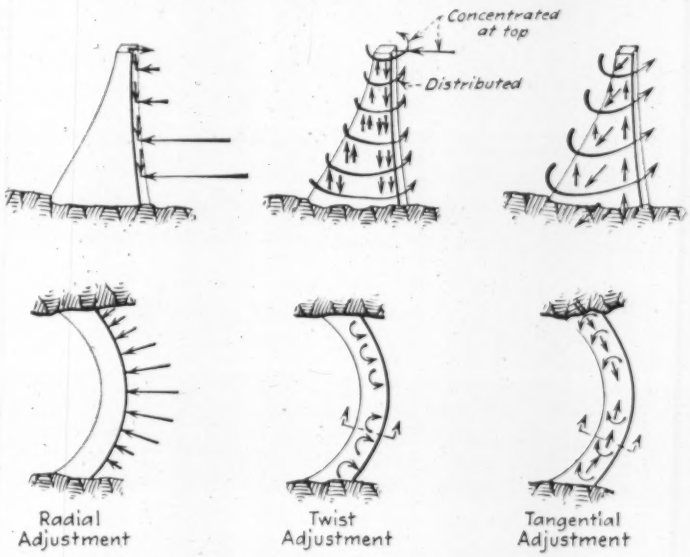


Fig. 2—Forces used in trial-load method

After completing the analysis under the assumption of linear distribution of the normal stresses through the thickness of the dam, a correction introducing non-linear distribution may be made by the following procedure, which is not exact but which will nevertheless bring the problem closer to a final solution: (1) Accept temporarily the distribution of loads causing bending and compression in the arches and cantilevers. (2) Some of these loads must without question be applied at the upstream face; to others, which represent the interaction between arches and cantilevers, there may be asisgned, according to estimate, a certain distribution through the thickness of the dam. (3) the analysis of the individual arch or cantilever is now a problem in two dimensions, and the non-linear distributions of the stresses through the thickness, corresponding to the assumed loads, may be determined at least approximately. (4) The changes of the deflections may be determined corresponding to the new distributions of stresses. (5) The resulting discrepancies between the radial deflections of the arches and cantilevers may be practically insignificant; if they are not negligible, they may be removed by a subsequent radial adjustment, which will lead to slight changes of the bending movements. (6) The bending stresses may be changed in proportion to the changes of the bending moments. (7) The stresses due to the twisting moments may be corrected by assuming non-linear distributions through the thickness similar to those found for the bending stresses.

This method is still in a state of development. The suitability of each possible choice of procedure is determined by experience.

As described, the trial-load method has been developed especially during the last ten years by engineers in the United States Bureau of Reclamation under the direction of Dr. Elwood Mead, commissioner of reclamation, and R. F. Walter, chief engineer. Particular acknowledgment is due J. L. Savage, chief designing engineer, for making the work possible.

Flood Control on Alluvial Rivers—III

A survey in three articles of the planning problems, methods of flood control and types of flood-protection works, with particular reference to flood control on the Mississippi River

By T. H. JACKSON
Brigadier General, Corps of Engineers; President Mississippi River Commission, Vicksburg, Miss.

Flood-Control Works on the Mississippi

Preceding articles (*Engineering News-Record*, Jan. 8 and Jan. 15, 1931) have discussed flood-control problems and planning and the accepted methods of flood control, as levees, reservoirs and diversions. This article considers flood-control works — describing levees, revetment and spillways in some detail and other works in brief outline. —EDITOR.

FLOOD WORKS comprise chiefly levees, revetment and spillways. Where reservoirs are employed dams become important flood works, but their design and construction are no different than those for reservoirs for other purposes. Other flood-works operations such as clearing and channel enlargement by dredging also conform to usual practice.

Levee Design and Structure

A levee is an earthen embankment built to prevent the inundation of an area subject to overflow by floodwaters. To accomplish its purpose, such an embankment must be high enough not to be overtopped and broad enough to escape destruction through saturation or piping. If made secure against the latter two hazards, it will in normal soils be safe against failure by lateral displacement.

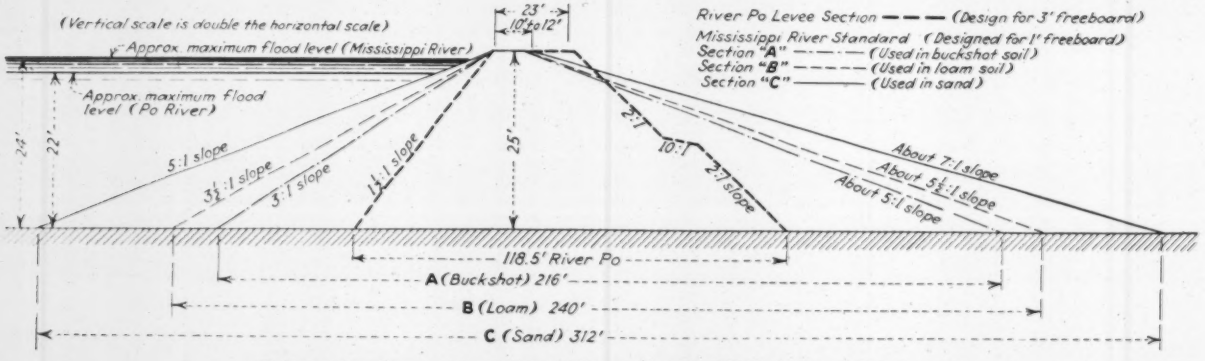
In general it is not possible to establish the flow line of a future flood with absolute precision. For this reason, and also to prevent overtopping by waves, the levee should be carried somewhat above the flow line used as the basis of its design. This clearance (a factor of safety in height) is called the freeboard. It increases construction cost materially, hence it should be held to the minimum that is consistent with security and reasonable costs of maintenance during floods. It is possible to raise the levee temporarily by emergency topping during floods, but this is very expensive; it also has its physical limitations.

The justifiable freeboard above the flow line assumed in design is a rather complex function of: (1) the frequency with which the assumed flood may be expected to occur; (2) the frequency with which and the degree to which it is likely to be exceeded; (3) the cross-section of the levee.

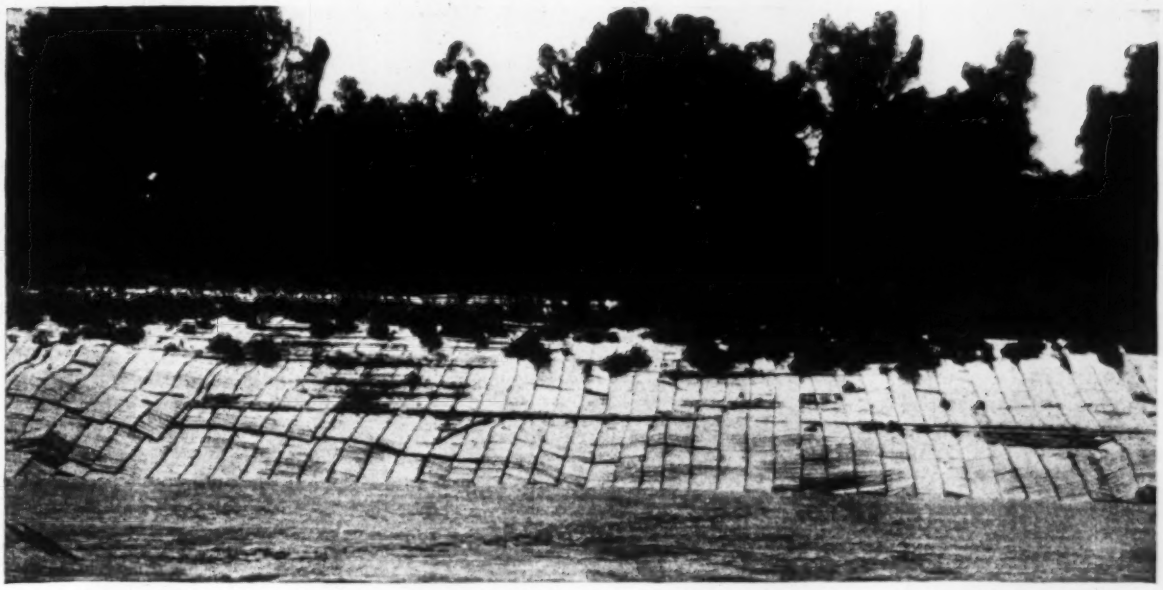
General experience indicates that a freeboard of at least 3 ft. should be used when the design is based on the maximum flood of record; but that if the design is based upon the computed maximum probable flood a freeboard in excess of about 1 ft. is in general not warranted.

Levees may be grouped as to cross-section into two classes, trapezoidal and banquette levees. In the former the section is a truncated triangle whose landside slope is buttressed when the levee exceeds a certain height. Each type has its advocates and advantages. Prior to 1928 the banquette type was used almost exclusively on the Mississippi River. Under the present project for flood control, however, the trapezoidal type is used on the lower Mississippi, while the banquette type is used above the mouth of the Ohio. The present tendency throughout this country is to discard the banquette type entirely.

Many factors enter into the design of the cross-section. Ordinarily the steepness of the riverside slope is determined by the nature of the material; and this face of the embankment is given the slope on which experience



Comparative cross-sections of 25-ft. levees for the Mississippi and Po rivers



Articulated concrete block revetment

This type of mattress adapts itself nicely to the hidden irregularities of the submerged bank. The area below the line of vegetation was under water when the mattress was laid.

indicates that the material available will ordinarily remain. (On the Mississippi River the maximum steepness considered advisable is 1 on 3.) The width of the levee crown is determined to a great extent by the freeboard provided. If the freeboard is slight, the crown should be wide. If the freeboard is great, the crown may be narrowed. The crown width is, however, frequently determined by special conditions such as its use as roadway. The bank slope of the levee should be sufficiently flat to prevent outcrop of the seepage line. The cross-section is, therefore, dependent upon the nature of the levee material and the duration of floods of the stream in question. Both slopes and the crown of the levee should be sodded or seeded to grass.

Three different trapezoidal levee cross-sections are in use in the present project for the flood control of the Mississippi River. These sections vary with the material, which is grouped into the three general classifications: buckshot (clay), loam and sand. The cross-section for each of these three classes of material is given in the accompanying diagram.

Bank Protection by Revetment

The greatest threat to levees is usually bank caving. This caving varies widely with different rivers and in different stretches of each river, since it is dependent upon the character of flow and of banks. When bank caving threatens a point in the levee line, the threatened portion of the line is retired landward or the caving is halted by bank protection. The course adopted depends upon local conditions.

Bank protection is of two general classes: Intermittent structures designed to slacken current, and continuous covering (revetment) designed to protect the area exposed to scour. There are many types in each class. The intermittent class is best represented by the groin type, the continuous class by the mattress type. Many types of bank protection have been used in this country and by varied interests. However, where there are large stretches of badly caving banks, the only type worthy of much consideration is some form of the mattress type, which is discussed in a general way below.

Mattress revetment consists of a continuous covering of material that will resist current action. The covering should extend from the top or from near the top of the bank to and about 50 ft. beyond the base of the underwater bank. The revetment above the low-water line (called upper-bank paving) should be material not subject to decay, such as stone, concrete, etc.; the portion below the low-water line (called subaqueous mattress) may be concrete or wood.

The upper bank should be graded to receive its paving. The slope normally employed is 1 on 3 to 1 on 4. The paving is usually riprap stone laid by hand, or concrete, plain or mesh reinforced, placed in blocks or poured *in situ*.

The subaqueous slope cannot be graded. The mattress must, therefore, be flexible enough to conform substantially to the irregularities existing at the time and which result later from erosion or other causes. Furthermore, it must be strong enough to do this without rupture.

There are in present use on the Mississippi River three types of wooden subaqueous revetment—the framed, the woven, and the fascine mattress; and two types of concrete subaqueous revetment, known respectively as the articulated and the lapped-slab type.

The framed mattress is used below the Red River. It consists of willow brush tightly compressed between two timber grillages. It is fabricated in units 100x150 ft., which are towed to the point of use, connected by means of timber and pole splices and steel strand and sunk against the caving bank by deposition of stone ballast.

The fascine mattress is used between the Ohio and Red rivers. It consists of bundles of willow brush (fascines) placed side by side with axes normal to the current. The fascines are about 16 in. in diameter and of length equal to the width of the mattress, which may be from 100 to 250 ft. The mattress is fabricated at the

site of the work and is sunk in lengths of about 1,000 ft. by depositing stone ballast in the shallow cribs formed by members of a pole grillage attached to its upper surface.

The articulated concrete mattress, used interchangeably with the fascine and frame mattress south of the Arkansas River, consists of concrete slabs 3 in. thick, 11½ in. wide, and 3 ft. 11 in. long. The slabs are cast in groups of 25 through a sheet of mesh reinforcing, thus giving a small articulated mat 4 ft. wide and 25 ft. long. These small mats are joined together at ends and sides on the laying plant, to give a continuous mat 140 ft. in length parallel to the bank and with a width necessary to reach the desired point at the bottom of the river.

The lapped-slab type of concrete revetment is used interchangeably with the fascine mattress between the Arkansas and Ohio rivers. It consists of reinforced slabs cast and placed as individual units. The slabs are 4 in. thick, 6 ft. wide and 11 ft. long, with trimmed corners from which small loops of ⅜-in. galvanized strand protrude. These slabs are connected on the laying plant by means of cable, and a continuous mat is formed about 500 ft. long parallel to the bank and of the width necessary to reach the bottom of the river. The completed mattress has somewhat the appearance of a shingled roof.

Both types of concrete mats are, like the timber mats, secured to the bank by cables attached to deadmen.

Above Cairo no concrete mattress is employed. The subaqueous revetment consists of light wooden mattress woven of willows or boards. When lumber is used the mattress is composed of 1-in. boards 4 to 6 in. wide passed under and over "weavers" consisting of similar boards lap-spliced and running the entire length of the mattress. At the upper and lower ends of the mat the weavers are clamped between "headers." Top planks, placed over the woven boards and weavers, and cross-binders form shallow cribs to retain the sinking ballast. The mat is sunk about 300 to 500 ft. behind the weaving. It is anchored to the bank before sinking, but the lines are later recovered. When willows are used instead of lumber the process is essentially the same.

The cost of the several types of revetments varies, with the depth of the water and various other local features. The cost in the river between St. Paul and St. Louis is about $25,000 to $40,000 per mile; on the Missouri River below Kansas City, about $85,000 per mile; between St. Louis and Cairo, about $140,000 per mile; and below Cairo, about $325,000 per mile. The annual maintenance of revetment in the river below Cairo is about 5 per cent of the first cost. A revetment in the lower river means a capitalized cost of about $650,000.

In comparing the cost of a levee system, where setbacks are to be made as needed to take care of bank caving, with the cost of a system that is protected by revetment, careful consideration must be given to the rate of caving, the value of the land involved in the setbacks, the cost of the levees and the construction and the maintenance costs of the revetment.

Below Cairo, where the caving averages a little less than 40 ft. a year, the average value of the land is about $75 per acre, the average levee costs are about $150,000 and the revetment costs are as indicated above, a levee system could be provided and maintained indefinitely under a setback policy for an initial investment of about $350,000 per mile. On the other hand, the initial investment would have to be about $800,000 per mile for a revetted levee system. The difference of about $450,000 per mile therefore represents the difference in the cost between the non-revetted and the revetted systems without adding to the flood security.

Careful consideration will show clearly that for economical justification of the revetted system the land must be worth about $3,000 per acre where the rate of bank caving is average (about 40 ft.) and at least $1,000 per acre where the bank caving is three times the average rate (about 120 ft.). There are few places on the Mississippi River where a rate of more than 120 ft. has been maintained for 30 years, which period is now set as the prospective life of the levee at any point. However, in making estimates for a system only the average caving should be used.

It is believed that the above discussion shows clearly that it can never be a sound policy to provide a revetted levee system when the property to be used in the construction and the maintenance of the levee system is agricultural land.

Spillway Types and Structures

The flow of water through a diversion floodway may be free or regulated. It is free when there is no obstruction to flow above the bankfull stage. It is regulated when the flow above the bankfull stage is in any way

Lapped-slab concrete revetment is a type frequently used for upper-bank paving

Topping out a levee with sand bags is very expensive and should be avoided

regulated. This regulation is provided by means of spillways. Spillways may be classed in general as controlled and uncontrolled. In the former the water is admitted to the floodway only as desired. In the latter it passes into the floodway when the river reaches a predetermined height. A controlled spillway is a movable dam or other structure which can be operated to control the flow of water through or over it. An uncontrolled spillway is a form of overfall dam. Except where the slope from the bank to the trough of the basin is so small that cutting down of the bank by an uncontrolled diversion flow is not feared, it is good practice to limit the stage of flow throughout the floodway entrance by use of a weir with crest at bank elevation.

In the Mississippi River plan the existing levee at a grade about 3 ft. below standard serves as a controlled spillway which is topped and crevassed. This type of spillway, which is known as the fuse-plug type, has certain advantages over the controlled spillway with its high cost and difficulties of operation.

In determining whether or not the flow through the floodway shall be free or regulated the following factors should be given careful consideration. If a proper value can be given to each a decision can be readily reached:

1. In the case of free flow, the flow line in the river below the diversion and in the stretch immediately above will, for all floods less than that of the plan, be lower than would exist with regulated flow. This means that during all floods of less magnitude than that of the plan there will be less maintenance cost within the stretch of river affected, but more in the diversion floodway. It means also that for the same floods there will be less overflow in certain backwater areas. Where, however, the diversion enters a backwater area below, there will be greater overflow in that area, with a net result that may be considered as of little if any importance.

2. Since free flow at bankfull stage gives a lower flow line at ordinary floods than a regulated flow, the lessened flow will maintain less channel capacity immediately below the point of diversion than would be maintained by the greater flow in the case of a regulated diversion flow. In a case where free flow has existed, no change in channel capacity can be expected. In other words, where a levee is removed to give free flow there will be deterioration below of channel capacity, and this lost capacity must be compensated for either by increase in the capacity of the diversion floodway or in that of the main channel.

3. With free flow the floodway is subject to overflow at bankfull stages. The value of its lands is therefore only that of land subject to overflow at the bankfull stage. With regulated flow the frequency of overflow is greatly reduced and the value of the floodway lands is much greater.

4. With free flow the drainage of lands back of the floodway levees is interfered with at every bankfull stage. This means serious impairment of their value. With a regulated flow the frequency of this interference with drainage is greatly reduced and the impairment of the value of these lands is greatly lessened.

5. If the flow is regulated by means of a controlled spillway, difficulty may be expected in operating the spillway. All interested parties along the river below the diversion and along the river above, within its influence, will insist on the spillway being placed in operation long before the time set in the plan. Correspondingly all interests in the floodway will protest against the placing of the spillway in operation. The latter interests will be supported strongly by the interests holding lands immediately back of the floodway levees where the drainage is intercepted. The plan for the Sacramento River brought out this point clearly, and after the construction of one controlled spillway the plan was changed to eliminate such structures in the construction of later diversions.

6. Spillways are expensive in first cost and maintenance.

To appreciate the importance of (4) above it is necessary to understand clearly the location of a diversion floodway in a basin. The drainage of a basin is toward its center, with the main natural drainage channel near the lowest point. This means that the normal location of the floodway is that which includes the lowest part of the basin. The result is that the levees are usually on the side slopes of the basin and in that location intercept the drainage of all the area of the basin not included in the floodway. The problem of disposing of the drainage of the areas thus excluded is a most difficult and expensive one, for it involves complete reclamation. A free flow through the floodway involves a much higher cost of operation of the pumping plants of this reclamation plan than in the case of a regulated flow.

The fuse-plug levee enters into the problem of free versus controlled floodway flow with all the advantages and disadvantages of the controlled spillway except those indicated under (5) and (6). It has an advantage over

the controlled spillway of an inexpensive first cost and maintenance and the disadvantage that after being crevassed it is not available for use before the next flood season.

The pronounced reaction of the engineering profession to the use of the fuse-plug levee has been one of the outstanding features of all discussions of the present Mississippi River plan. It is typical of the usual reaction of the individual toward something new in his profession concerning which he is imperfectly informed. Few if any engineers appear to know that the idea is not new but very old, and has been in use for years to meet similar situations. It is most peculiar, too, that in spite of the almost universal condemnation of this type of spillway by our engineers two of the three important plans offered during the past two years as modifications of or elaborations of the existing plan by prominent engineers of the Mississippi Valley have included a fuse-plug spillway as an important feature of the proposed plan. This is offered for the consideration of those who have objected to the use of the fuse-plug spillway in apparent ignorance of its good features.

As an instance of the harmful influence of the lack of knowledge of fundamental principles of alluvial stream-flow upon the design of flood-control works there can be cited the pronounced tendency on the part of engineers concerned with local flood problems only to insist on bank-stage diversions where levees already exist. Such action must result in deterioration of the main flood channel, which means a higher flood flow line with consequent increase of the level grade in the stretch of river concerned, unless the capacity of the diversion can be increased.

Other Control Structures

Flood-storage reservoirs differ little from reservoirs for commercial use. There is no good reason for any discussion here of their design and construction.

There is nothing special about flood clearing. It is the ordinary practice to cut down the timber and to prevent its growing in future. Another practice is that of clearing, grubbing and placing in grass or cultivation in the hope that there may be no maintenance. The added cost of grubbing, breaking up and seeding will ordinarily exceed the capitalized cost of maintenance where such work has not been performed. The important thing in maintenance is frequent cutting of the growth. Going over the area two or three times a season will give lower cost in the end than going over it once a season and much lower than going over it every two or three seasons.

Dredging under a flood plan presents no features differing materially from established dredging practices, hence no discussion here. The fact that there will be constant maintenance warrants careful consideration of future storage for dredged material. The period for which storage should be provided depends on the future value of the land compared with the rate at which money increases at compound interest.

Construction and maintenance of flood-control works opens up a broad field. Construction methods have been covered by many writers and are quite well known. Little, however, has been offered on maintenance where the field is very special and technical. It seems very desirable that the very technical subjects, flood-stage predictions and flood-fighting methods, should some day be fully presented.

Hydrated Lime as Used in Engineering

By R. J. HOLDEN

Professor of Geology, Virginia Polytechnic Institute, Blacksburg, Va.

IN CONNECTION with a laboratory study of the keeping qualities of hydrated lime, a study of the literature has brought out several points in regard to this material that may be of interest to engineers. One point of interest lies in the changes in the relative quantities of quicklime and of hydrated lime used. Curves are presented herewith covering the period from 1906-1928, showing the total annual production of lime, of quicklime, of hydrated lime, of lime used for building, of quicklime used for building, and of hydrated lime used for building, as compiled from *U. S. Mineral Resources*, the U. S. Geological Survey and the U. S. Bureau of Mines.

The production curves are an interesting commentary on the industrial conditions of the country. The unsatisfactory industrial conditions of 1907 and 1908 are distinctly reflected in the production curves. The effect of the World War and of the participation of the United States in this war are likewise reflected in these curves. The deflation period in 1921 is sharply brought out in the curve for the quantity of quicklime. A striking feature of the quicklime-production curve is that there has been no increase in the quantity of this material from 1906 to date. In contrast with this, hydrated lime shows a marked increase. Not only has there been an increase from 120,357 tons in 1906 to 1,612,818 tons in 1928, but there has been a steady increase which has been almost unaffected by the influences which depressed the quicklime industry. Prior to 1906 the quantity of hydrated lime produced was so small that this material had not brought itself to the attention of engineers to any considerable extent as a structural material. The sharp improvements in industrial conditions following 1909 gave such an increased production of hydrated lime that this material forced itself on the attention of engineers, and various references in engineering literature call it a new material.

The curve for building-lime production, in spite of a sharp turn downward from 1906 to 1918, follows the curve of total production until 1920. The following year was a time of falling prices and there was a sharp curtailment of total lime production, but this curtailment did not apply to building lime.

The curve for production of quicklime used for building shows a falling off in 1923. In contrast with this curve, that for hydrated lime used for building shows a gradual increase until 1925, when the use of hydrated lime for building purposes exceeded that of quicklime.

In view of the increasing use of hydrated lime as a building material, it seems in order to outline some of the outstanding features of the chemical properties of hydrated lime in comparison with those of the better known quicklime. When limestone is heated sufficiently the $CaCO_3$ loses carbon dioxide and becomes quicklime, CaO. When water is added in suitable amount a lime putty is formed. This is slaked lime. When less water is added a dry powder forms, which is essentially $Ca(OH)_2$. This is the hydrated lime of commerce. It

is the same material as lime putty except for its physical condition. On account of its dry condition it may be readily mixed with cement and has some other advantages which quicklime does not have. Its satisfactory preparation requires a hydrator, and it is therefore generally prepared at the kiln and not at the point of utilization. When converted to lime putty by the addition of more water it is identical with slaked lime produced from quicklime.

Hydrated-lime mortar and quicklime mortar are identical in functions and set. The preliminary set of both is due to the evaporation of excess water, and the final set is due to carbonation. Carbon dioxide replaces the water of the hydrate, reforming the calcium carbonate. The chief differences then between quicklime and hydrated lime lie in the different physical conditions and the different chemical properties.

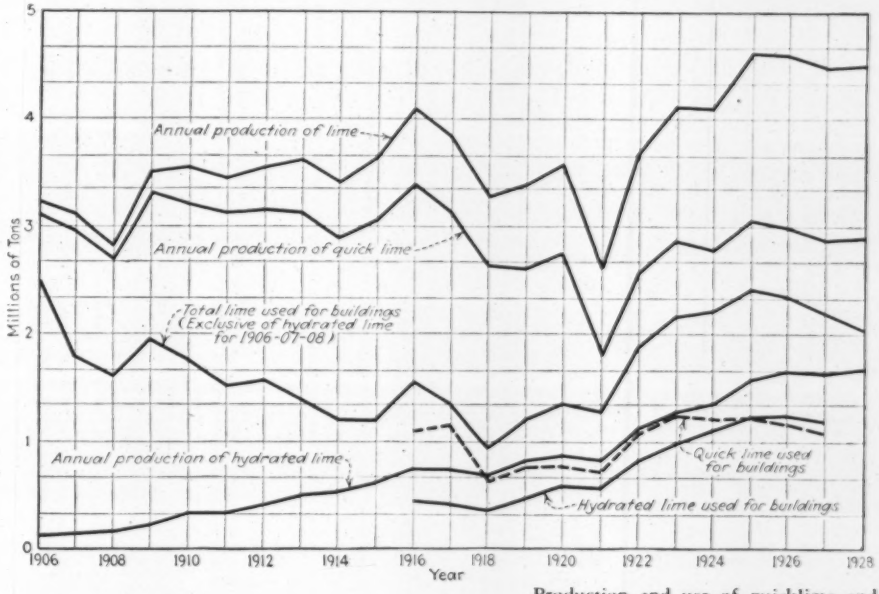
Quicklime does not keep well. When exposed to the air the lumps soon crack and the mass breaks down to a lumpy powder. This is the air slaking of lime. Chemically, this is hydration and not carbonation. Quicklime will not carbonate, but when hydration is complete, carbonation starts. Both the water for hydration and the carbon dioxide for carbonation may come from the air. As hydration precedes carbonation, the problem of keeping quicklime rests in excluding the water.

Hydrated lime spoils not by hydration, since it is already fully hydrated, but by carbonation. The problem of keeping hydrated lime rests in excluding the carbon dioxide. As the gases which deteriorate quicklime and hydrated lime are both in the atmosphere, the problem may seem the same in both cases, namely, to exclude the air. Practically, there are differences, since the water content of the air is much more variable than its carbon dioxide content.

There is very little in engineering literature on the rate of carbonation of hydrated lime. Hydrated lime retains its essential properties to the extent that carbonation is prevented. It is, therefore, to the interest of the user to prevent carbonation. After mortar has been placed in construction it is desirable to promote carbonation. Owing to the differences in physical constitution and in environment the rate of carbonation of hydrated lime and of mortar are probably materially different.

The rate of carbonation of mortar and the time required for the completion of the carbonation are matters which have received some experimental attention and which are referred to in various places in engineering and chemical literature, but these statements are not in agreement. Indeed, there is such wide variation that it is impossible to reconcile them.

When hydrated lime first came on the market in quantity it was hailed as a material which would keep indefinitely. It was supposed that the coating of carbonate which formed over the outside would protect the material from further carbonation. It is now well known that such is not the case and that freshly hydrated lime in powdered form quickly carbonates when exposed, and that it is not a good practice to keep it many months. On the other hand, the rate of carbonation after a few months falls off rapidly, and complete carbonation is a matter of many years.



Production and use of quicklime and hydrated lime in the United States

Carbonation acts progressively from the outside of the bag inward, and that portion of the hydrate which is not reached by the carbon dioxide is as good as when freshly hydrated. The portion which is carbonated is so much inert material and is not otherwise harmful. The value of partly carbonated hydrate is inversely proportional to the amount of carbonation. The depth to which carbonation has extended into the bag can be easily determined roughly by the amount of effervescence with dilute hydrochloric acid.

Planned City Development Increasing

Figures released by the committee on city and regional planning of the American Institute of Architects indicate that 94 new cities and counties during the year 1930 passed zoning ordinances, bringing the total number of cities entirely or partly zoned to more than 900. In the United States there are now in existence more than 800 city and regional planning commissions, including 28 regional commissions and 37 county planning commissions. The need for this type of activity is indicated by the fact that approximately 65,000,000 persons in the United States now live in cities or towns of more than 2,500 inhabitants. These figures are according to the 1930 census.

Sewer Infiltration Control at Miami

Multiple pumping dictates rigid specifications, special joints and other details and minimum leakage tests

By J. E. JEWETT
Office Engineer, Department of Public Service, Miami, Florida

BECAUSE the surface of the ground in Miami is so flat and of such a low elevation, it is economical to secure a scouring velocity in the sewers by constructing a series of pumping stations in place of building the sewer deeper and deeper as it progresses toward the outlet and there build a single pumping station. As sewage from certain sections of the town will have to be pumped two or three times before disposal it seems to be a wise policy for the city to increase its capital outlay by obtaining as nearly tight sewers as possible rather than increase the operating expenses by pumping the excess water reaching the sewer by infiltration.

During 1926 and 1927 the City of Miami contracted for the construction of some 20 miles of sanitary sewer with five pumping stations. The specifications required a test for watertightness which has become known as the "exfiltration test." This test was conducted as follows: After the main sewer was laid, but before the ditch was backfilled, all wyes having been sealed by means of a concrete stopper held in the bell by grout, a 6-in. riser was fastened to the main sewer at one manhole and the sewer sealed at the other manhole. Water was then run into the riser until the crown of the sewer at the upper manhole was under a 4-ft. head. The time required for the water in the riser to fall 1 ft. (due to leakage) was measured. From this was computed the rate of exfiltration in gallons per mile of sewer per 24 hours, regardless of sewer diameter. A chart (Fig. 1) was provided the testing inspector so that the rate of exfiltration could be readily and quickly determined in the field. If this rate exceeded 10,000 gal., the contractor was required to repair leaks or do whatever was necessary to reduce the rate of exfiltration to 10,000 gal. or less.

All sewer joints were made under the following specifications:

Under the bell of the last pipe a suitable form of sufficient length to incase the full diameter of the pipe is to be laid, the spigot inserted in the hub to its full depth, and a gasket of jute or oakum, twisted and thick enough to even the inverts caulked into the joint, the ends of the form brought up around the pipe and tied. The annular space shall then be filled with 1:2 cement grout just thin enough to run through a hose and run around the joint, the joint being poured from one side only. Before the grout has set, the upper portion of the joint shall be formed of 1:2 cement mortar well wiped into place.

This joint is especially adaptable for underwater lines.

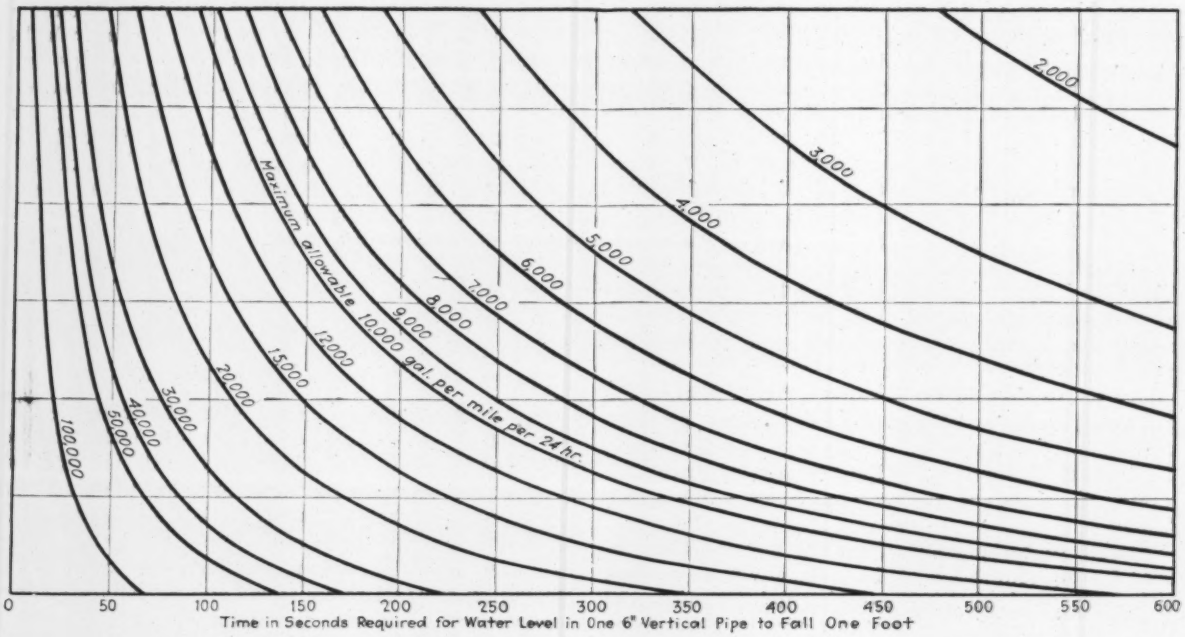


Fig. 1—Chart of exfiltration in thousands of gallons per mile per 24 hours for use in sewer testing

If a riser pipe of D diameter is used in place of 6 in. multiply the observed time by $D^2/36$ and apply the curves. If the water level is lowered F in. instead of 1 ft. apply the curves and multiply the result by $F/12$. If N vertical pipes (including risers for laterals) are filled with water, apply curves and multiply result by N.

since the entire sewer pipe may be submerged and yet the joints will be as tight as those made in the dry. A richer mortar should be used in wet work to take care of the possible segregation.

The material commonly used for forms is a very light canvas, misprinted calico or other inexpensive cloth that will hold the mortar. The cloth is hemmed along both sides (not the ends) and wires of lengths greater than the outside diameter of the pipe threaded through the hems and the ends twisted across the top of the pipe. The length of the form should be 2 in. less than the outside diameter of the bell. The width of the form can best be determined by cut-and-try methods. Neither the forms nor the wires are removed after the joint has been poured. This type of joint has been found to be stronger than the pipe itself and if properly constructed 99 joints out of 100 will be watertight. Pipe laid with this joint cannot be exposed to direct rays of the sun for long periods of time without resulting in rupture of the pipe due to expansion. The ditch should be partly backfilled very soon after laying, in order to prevent rupture of the pipe or at least displacement.

The exfiltration test was applied only to those lines above prevailing groundwater level. The lines below this level were checked by allowing the leakage to flow to the pumping stations, where it was accurately measured by noting the time required to raise the water elevation in the wet well a known distance.

The sewer system was accepted on the basis of the above tests. After the first heavy rain the pumps handled three and four times as much water as the allowable 10,000 gal. per mile of sewer per 24 hours, even after making liberal allowance for the few buildings which had been connected to the sewer system. As this condition continued to prevail after every rain an investigation was made. It was found that considerable leakage occurred through the concrete stoppers in the wyes (not through the joints or the pipe proper). Several manholes were found to be leaking, particularly around the wrought-iron steps. The pickholes in the manhole covers were a source of appreciable leakage, particularly during and immediately following heavy downpours of rain when the entire casting might be covered with water. When the contractor (plumbers after acceptance of contract) made connection between the wye on the street sewer and house lateral, difficulty was experienced in removing the concrete stopper in the wye. After the bell of the wye was cracked or broken, as was often the case, a good tight connection was not made. The house laterals were not tested for leakage, resulting, no doubt, in an inferior piece of workmanship and consequently developing a large amount of infiltration after each rain. Continued observation of this system has convinced the writer that the method of checking the watertightness of the sewers by direct measurement, when the sewer is below prevailing groundwater level, is not nearly so satisfactory as the exfiltration test. The groundwater may be low at the time of the observation and the results be acceptable, but after several heavy rains the sewer may leak to such an extent as to be rejected.

To prevent water entering the sewer through the pickhole of the manhole covers and to eliminate the large quantities of sand, rock and débris which found its way into the sewer through this opening, a new pickhole was designed (Fig. 2).

New specifications were written requiring that each and every wye branch be capped with a cast-iron stopper and given a hydrostatic test by the manufacturer. The caps are held in the bell of the wye branch by means of a poured joint of rosin and paraffin (about 9 to 1 ratio). This mixture was used only after considerable experimenting with various materials. The caps are further held in place by a cast-iron brace and wedge (Fig. 3). This method has been found satisfactory in that it makes a tight joint and still permits easy removal without damage to the bell of the wye. If laterals are to be run by the contractor, the cap and brace are removed and inserted in the end of the lateral.

All manholes are of poured concrete to a point 8 in. above the crown of the highest pipe in the manhole, but

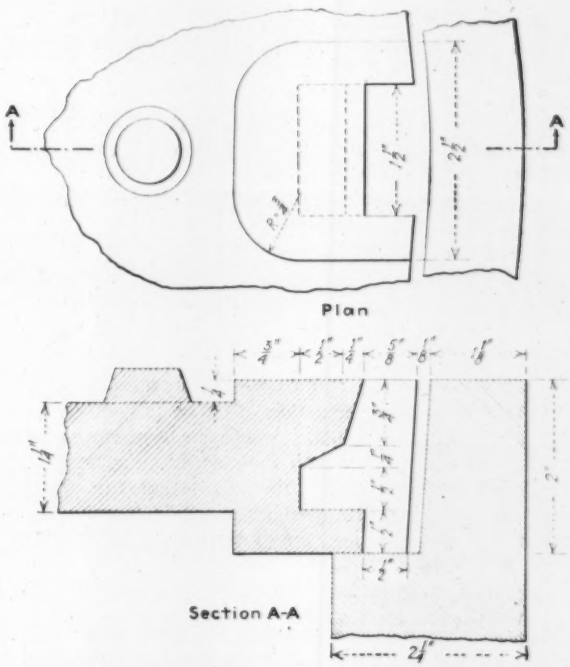


Fig. 2—Pick hole for lifting sewer manhole cover, Miami, Florida

in no case is the top of the concrete below El. +2. This method of construction eliminates leakage around the pipes and around the manhole steps. We have substituted a cast-iron step for the wrought-iron one.

The specifications now require the main line and the laterals to be tested for exfiltration with a minimum head of 4 ft. but never less than enough to put a head of 1 ft. on the crown of the highest lateral. For sewers below the prevailing groundwater level, the 4-ft. head is measured from the groundwater level rather than the crown of the main sewer. The plumbing code provides for a water test on the house sewer from the end of the lateral to the plumbing fixtures. This gives a 100 per cent tested conduit from the point of sewage entrance to the pumping station.

It is readily seen that this method of testing will trap air in the laterals or in the wye branch if no lateral is built. Any of the trapped air which might escape during the test due to the pressure on it will show the same effect as so much water leaking out. Because it is more difficult to build airtight than watertight, a hardship was suffered by the contractor. For this reason the cast-iron caps were then tapped and plugged at a very small cost. The plugs are removed while the sewer and laterals are being filled with water and are replaced only when it

seems certain that all the air has been replaced by water.

The cost of the actual testing is dependent upon the availability of water, the number of tests required before acceptance and the organization for the work, but probably does not exceed 5c. per foot of sewer tested. There has been only a very slight, if any, increase in cost of construction under the present specifications as compared with the old ones, which required no leakage test.

The specifications for the hydrostatic test of the pipe are the A.S.T.M. Standard.

The contractors have complained that the city requires the manufacturer to subject only 1 per cent of his pipe to the hydrostatic test, wyes excluded, while the field test covers 100 per cent of the pipe. This in effect causes the contractor to bear the expense of removal of pipe, which in itself would fail to meet the specifications had it been tested individually, but which was accepted because it came from a given lot of pipe which was tested (1 per cent) and passed. There is some foundation for this grievance. It may be necessary to require a larger percentage of the pipe to be tested by the manufacturer.

Under conditions elsewhere a maximum allowable exfiltration of 10,000 gal. per mile per 24 hours may be excessive or may not be. Many will contend that a blanket specification regardless of the sewer size and depth, such as Miami has, is not based upon logical reasoning. Gallons per mile per day per inch of diameter has been used as a unit of infiltration; the number of joints, the number of feet of joint, the number of feet of joint below a given elevation or below prevailing water level, and many other such terms have been employed in an effort to determine a unit that would be acceptable in all cases. We have found that the larger the pipe the better the joint, as the annular space is larger. Likewise, the larger the diameter of the pipe the thicker the walls, and consequently the less likelihood of leakage through the walls. For these and many other reasons, we have adopted for testing purposes the exfiltration unit of gallons per mile per 24 hours.

Testing by exfiltration is a reasonable and relatively easy means of determining the tightness of a sewer. We know the method is practicable and inexpensive. We do not know that the leakage under our test represents the probable amount of infiltration under the same head but we believe the infiltration will not exceed that shown by the test. Local conditions will determine what test head should be used.

Below is a tabulation of actual results from recent tests which were made under the direction of R. L. Bow, construction engineer, who developed our cement grout joint under the general supervision of C. S. Nichols, city engineer. These results are not hand-picked, but are representative of the inspector's reports and might be expected from the entire job, whether the ditch is wet or dry:

Size, In.	Length Tested In Feet			Exfiltration Number of Test			
	Sewer	Lateral	Total	First	Second	Third	Final
8	337.0	25.0	362.0	50,000	20,000	11,000	10,000
8	335.0	307.2	642.2	10,500	8,500	.....	8,500
8	352.5	266.0	618.5	2,700	.....	.....	2,700
8	330.1	252.0	582.1	10,000	.....	.....	10,000
8	334.9	128.0	462.9	15,000	5,200	.....	5,200
10	334.7	252.0	586.7	112	.....	.....	112
10	303.5	69.0	372.5	28,000	10,000	.....	10,000
10	293.0	.....	293.0	28,000	9,600	.....	9,600
12	334.7	252.0	586.7	4,500	.....	.....	4,500
12	337.1	303.4	640.5	3,700	.....	.....	3,700
15	149.6	.....	149.6	10,000	.....	.....	10,000
15	284.8	151.8	436.6	10,000	7,600	.....	7,600

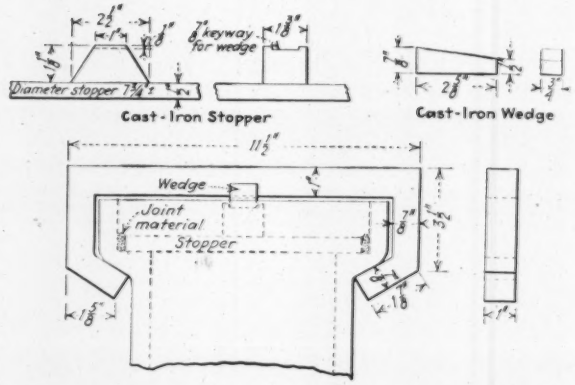


Fig. 3—Cast-iron brace and wedge for wye branch stopper on Miami sewerage system

The figures are taken from the results on three separate contracts. No general conclusions can be drawn from them because the figures may or may not strike an average for an entire job.

Out of 102 tested lines under consideration, 73 or 71.6 per cent passed on the first test, 21 or 20.6 per cent passed on the second test, 8 or 7.8 per cent passed on the third test. The minimum exfiltration on a first test was 112 gal. per mile per 24 hours and the maximum was 75,000. The average exfiltration on three separate jobs was:

Job	Length in Feet of Sewer and Lateral Tested	Average Exfiltration Gal. per Mile per Day
1	23,448.0	8,217
2	7,564.9	7,758
3	30,127.7	6,477

Our conclusions are: (1) Tight sewers can be secured with proper specifications, construction methods, tests, and inspection; (2) tight sewers can be had at a reasonable cost; (3) the cement grout joint described above eliminates most of the infiltration troubles; (4) the exfiltration test as applied is a reasonable determination of watertightness under the local conditions found in Miami.

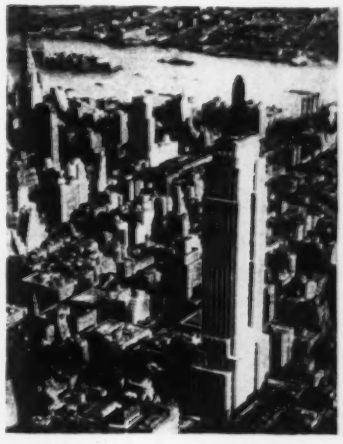
Neither the method of testing or the joint is patented, nor can either be patented.

Protection of Sewer Workers in London

Practice as to the use and type of sewer lamps and gas masks by laborers on entering sewers in 28 London metropolitan boroughs is given in *The Surveyor* of Dec. 5, 1930. No uniformity as to kind of lamps used was noted, eighteen different types being used varying from plain candles and miners' safety lamps to electric battery lamps. Gas masks have been considered in ten boroughs and are furnished in five boroughs. In four places gas detectors are used. In all but four places special regulations control the procedure of sewer workers underground. These relate to men on top, number allowed to enter, gas detection, opening manholes for preliminary ventilation, side entrance precautions, rope guards and life lines, prohibition of matches, smoking or open flames, special medical examination of men, and use of wooden tube as vent pipe where only one manhole can be opened. A. V. Cole, borough engineer of Finsbury, prepared the questionnaire through which the information was gathered.

Topping Out the Empire State Building

Observation tower 205 ft. high above roof of world's tallest building reaches to 1,250 ft. above the curb—600 tons of steel hoisted a quarter of a mile and erected in two weeks



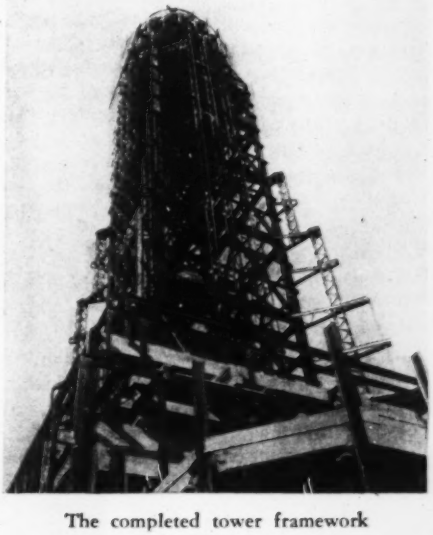
Empire State Building, world's tallest structure, showing the observation tower framework in place

THE TOPMOST steelwork in the Empire State Building in New York City has been hoisted into position 1,250 ft. above the Fifth Ave. curb. Placing of the last piece of steel marked the completion of the conical roof over the 205-ft. observation tower which rises from the roof of the 85th story of the building. Erection of this tower was delayed approximately a month after the completion of the main building frame, awaiting final decision on design, but when steel finally arrived on the job the 600 tons in the tower were hoisted into place in fourteen days and completely riveted in seventeen days. High winds were troublesome, but except for several rainy and foggy days when the top of the building was scarcely visible from the street, work was not delayed because of weather conditions.

The framing of the tower, shown in Fig. 3, is made up of three principal parts, a four-story stepped base 47 ft. high, a five-story main shaft 105 ft. high and a circular top piece 32 ft. in diameter and 53 ft. high, making the total height approximately 205 ft. This tower is designed against unusual horizontal forces, the main members being proportioned to resist a wind load of 30 lb. per sq.ft. of vertical projection of the tower plus a horizontal pull at the top of the tower of 100,000 lb., the latter load included to make the tower structurally suitable as a mooring mast for airships. The framework of the tower is to be inclosed by a sheet metal wall of novel design.

Having radically different column spacing from the main part of the building on which it rests, the lower-story framing of the tower base consists of a system of 72-in. plate girders. The next level above also utilizes plate girders 50 in. deep in one direction with diagonal bracing of 8-in. channels in the plane of the floor in the opposite direction. In the top story of the base, four trusses 9½ ft. deep, are provided to support the rest of the tower. Columns in the base section are 14-in. 235-lb. sections, and all levels of framework are tied together by diagonal braces to make a structure rigid enough to resist the considerable horizontal load. The base section varies in plan from 72x60 ft. at the bottom to 54x48 ft. at level *DD*.

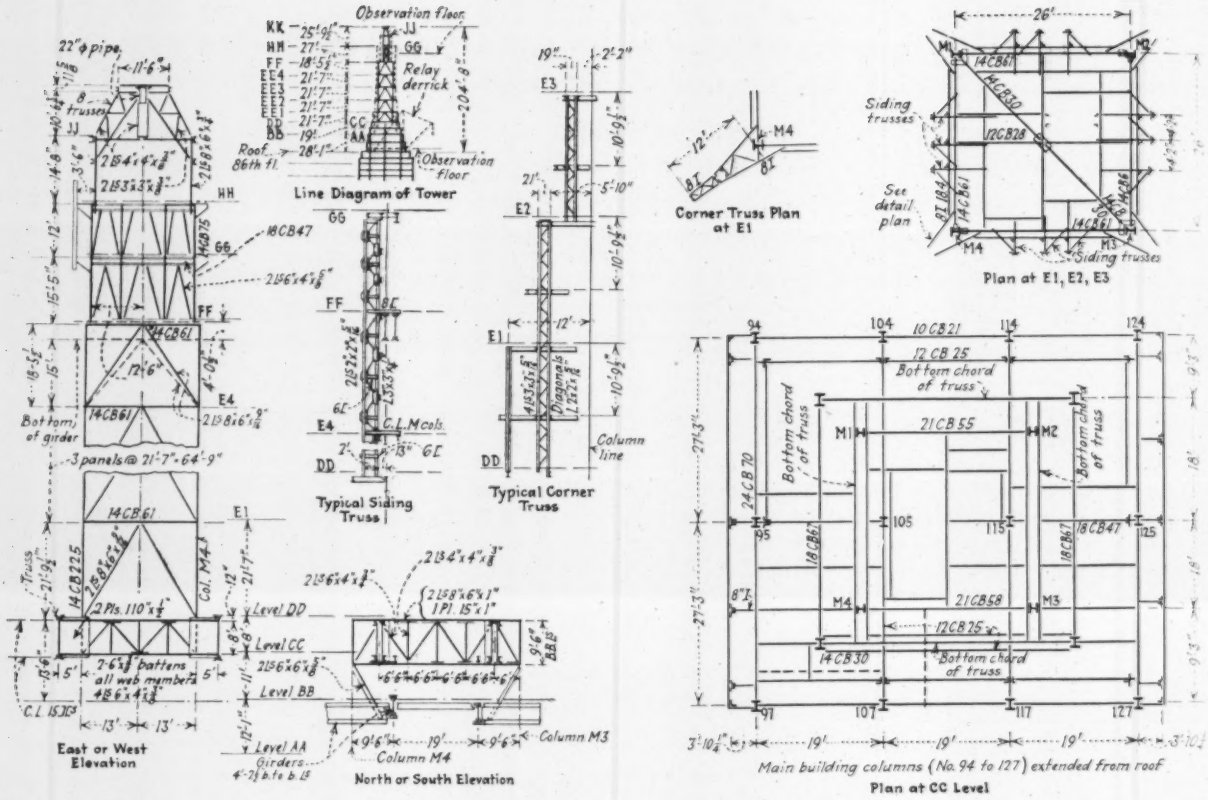
The main shaft of the tower is 26 ft. square, with 14-in. 225-lb. columns and 14-in. 61-lb. spandrel beams. K-type bracing is used in the walls. All wind load is taken by the wall steel, since the interior framework is interrupted by a stair well and elevator shaft. To assist the columns in transmitting the wind load to the panel points, each wall is braced by three outrigger trusses extending the full height of the shaft. Another set of vertical trusses is also utilized at each corner of the tower between levels *DD* and *E3*.



The completed tower framework

The top two stories of the top portion are heavily braced, making the steelwork somewhat complicated. An observation floor provided in this portion is about 1,210 ft. above the street. The top story, with a clear height of about 25 ft., is open, being roofed over by a series of shop-fabricated radially placed trusses. At the apex these trusses butt against a 22-in. steel pipe. When and if airships prove their ability to nose into a mast without aid from a large ground crew, mechanism and framing will be built up from the *HH* level suitable for the mooring operation.

Steel erection was accomplished by an extension of the method used to erect the main part of the building, described in *Engineering News-Record*, Aug. 21, 1930, p. 280. As stated in that article, steel was delivered in 33d St. and hoisted on that side of the building. Two relay derrick platforms were established, one at the setback on the 25th floor, and the other on an outrigger platform at the 52d floor. For the observation tower erection an additional 20-ton relay derrick was erected on an outrigger platform over the roof of the 85th floor. Experience on this building indicated that 400 ft. was near the economic maximum distance that steel should be raised with present hoisting equipment. Hoist drum capacity, being about 3,000 ft. of ¾-in. cable, limits the distance to less than 600 ft. with a five-part line. The most important factor limiting the hoisting distance on the Empire State Building, however, was the heating of the hoist drums and snatch blocks, particularly the latter. Sheave bushings, burned out by the long-continued operation during each hoisting of a load, had to be replaced every few days.



Structural details, observation tower, Empire State Building

The hoisting engines, 80- and 100-hp. electrically operated machines equipped with hydraulic emergency brakes, were located inside of the building. For the 25th-floor relay derrick they were located on the second floor; for the 52d-floor relay derrick, on the 30th floor; and for the 86th-floor relay derrick, on the 52d floor. The top relay derrick utilized a 60-ft. boom and a 72-ft. mast, both the mast and boom being shortened from their usual length to contribute an added factor of safety. The heaviest lift consisted of the girders and trusses in the base portion of the tower. These weighed about 6½ tons each.

Actual steel erection was carried out by a 15-ton guy derrick which moved steel direct from the 86th-floor relay platform to its position in the tower. This erection derrick was jumped upward seven times in erecting the 205-ft. tower, the last jump taking it to level *FF*, the 100th floor. From this position it erected the last 50 ft. of steelwork, bracing on the 33d St. side being left out until the end to permit the fall lines to reach the relay platform. No unusual methods characterized the erection work, most of the steel being erected piece by piece. Practically, the only shop-fabricated erection pieces were the roof trusses, these being lifted into place with their supporting columns attached.

The hoisting engine for the erection derrick, an 80-hp. electric machine similar to those used for the rest of the building, was located at the base of the tower on the roof of the 85th floor. At one side of the hoisting engine were two portable 110-cu.ft. air compressors. These supplied air to the riveting hammers through a 2-in. rubber hose, carried upward as erection progressed and manifolded at the end to accommodate three hammers.

Post & McCord was the steel contractor on this tower which was designed by H. G. Balcom. Shreve, Lamb & Harmon are the architects, and Starrett Bros. & Eken the general contractors on the Empire State Building.

Sliding Bumpers for Yard Tracks in England and Germany

A sliding bumper for stub tracks in yards, the movement of which combined with a friction-braking action will absorb the force of blows without injury to the cars, is being tried on the Southern Railway, England, and is used also in Germany, where it is known as the Jaegar device. On each side of each running rail and about 12 in. from it is a brake rail secured loosely to the ties by screw spikes and clips and having lugs or stops attached to the bottom so as to engage the ties if the rails slip. The bumper has six A-frames made of old rails, the legs of four frames being riveted to the brake rails, while the others slide on the track rails but have stirrups which pass under these rails and prevent any lifting of the bumper when struck. If a car runs against the bumper forcibly, it will slide back and carry the brake rails with it until their lugs strike the ties, the movement of which in the ballast absorbs the remaining force. The lugs are so spaced that they come into action successively. After displacement, the bumper can be pulled back to position by a locomotive with chain or cable. Where high speeds and heavy shocks are improbable, a single pair of brake rails may be used.

Notable Technical Surveys Presented at A.R.B.A. Convention

Ninety papers and committee reports on road building and street paving include several surveys of practice of notable scope and quality

THE EQUIPMENT exhibition and program of technical papers presented by the American Road Builders Association in convention last week at St. Louis, Mo., showed no diminution of interest in this notable annual congregation of the road-building industries. The spread of exhibitors and the diversity of exhibits are itemized in a special report elsewhere in this issue; the display was large and interesting even with the absence of the fine exhibits usually made by groups of manufacturers who this year decided not to show their products. The space vacated gave room for new exhibitors and exhibits of a greater variety.

The convention proceedings were crowded. Some 90 papers and committee reports were presented in 26 sessions in four convention days. Three and sometimes four simultaneous sessions were in progress both morning and afternoon. Attendance varied from a score or two at some of the meetings, where only a single paper or report was considered, to well over a hundred at division sessions of county or city engineers. Comfortable seats and pleasing surroundings were lacking in all the meetings, which were held in improvised rooms under the seat banks of a sports arena and close to the noises of milling crowds and operating machinery. The problem of attracting and making comfortable the audiences that are expected to sit two or more hours listening to technical discussions calls for serious consideration in planning future conventions.

The quality of papers and reports averaged high. The range of subjects was wide, including groups of papers on location, maintenance, low-cost road design and construction, financing and administration, airports, motor transport and contracting, and notable individual papers on grade crossings and intersections, consolidation of fills, subgrades and pavement bases, central and truck-mixed concrete and highway guard rail. Altogether, the tenor of the proceedings was technical and professional, although in several of the sessions a strong note was sounded of need to relieve unemployment and to conserve highway taxes for highway improvement, with strong centralization of administration and control.

Highway Location

One of the notable group reports was on highway location. This report was presented in seven parts, each prepared by a subcommittee working under a committee chairman and reporting to the general chairman, R. Getty Browning, locating and claim engineer, North Carolina state highway commission.

Classification and Right-of-Way—The subcommittee, with H. D. Palmore, state highway engineer of Kentucky as chairman, suggested the classification of highways as boulevards, carrying more than 5,000 vehicles a day, and as class A, B and C roads, carrying respectively 1,000-5,000, 500-1,000 and under 500 vehicles a day. Boulevard widths, grades, alignments, etc., should be determined for each individual case, but for class A, B and C roads the following limits were suggested:

Item	Class A	Class B	Class C
Width on fills, ft	36	30	24
Width in cuts, ft	42	36	30
Minimum surface, ft	20	20	18
Maximum curves, deg	10	12	20
Minimum width, right-of-way, ft	80	70	60
Minimum bridge width, ft	24	24	20

The following practice was suggested for securing rights-of-way: (1) acquisition by state, which is compensated by the county; (2) inclusion in bid of removal and rebuilding of fences; (3) inclusion by state of rebuilding of all property entrances; and (4) property to be held free of damages by construction operations.

Visibility—Using substantially the classification of roads given above, the committee, headed by H. R. Moffit, locating engineer of the Pennsylvania department of highways, recommended the following sight distances: for all classes with two or three lanes carrying 1,000 or more vehicles, 600 ft., for three-lane roads, 1,000 ft.; for two-lane roads carrying 500-1,000 vehicles, 400 or 500 ft.; for two-lane roads carrying less than 500 cars, 300 ft.

Grade Crossings—Urging the importance of the economic and traffic circulation problems as well as that of safety, H. O. Schermerhorn, engineer of bridges and grade crossings of New York, discussed general engineering principles rather than special details. Points brought out were: (1) All design and construction should be approved and supervised by highway engineers. (2) The division of cost should be fixed. (3) Sight distances should under no circumstances be less than 500 ft., and preferably 1,000 ft. (where 1,000 ft. is not practicable there should be compensation by widening the pavement and establishing warning signs). (4) Grades should not exceed 5 per cent, and where the driver is accustomed to very flat country they should not exceed 4 per cent. (5) Tangent alignment is not essential, but a curved alignment, with a radius less than 1,500 ft. should be approached with hesitation, and 800 ft. should be the absolute and rare minimum. (6) Where center piers or columns are not a necessity they should never be a choice. (7) Engineers should be decidedly hesitant to undertake drainage by introducing sumps and pumpings; present pumping drainage is purely experimental. (8) Vertical clearance of 14 ft. should be provided, which may if necessary be reduced to 13 ft. in cities. (9) Crossing spans should be designed for two- four- or six-lane roads and not of intermediate width. (10) Esthetic considerations should be observed. In conclusion, the only things that should be standardized are certain limiting elements such as grades, alignment and sight distances. Let no one establish a standard system of drainage.

Bridges and Culverts—Showing various examples of well and poorly located bridges, B. P. Harrison, Bureau of Public Roads, emphasized the importance of seeking square crossings, and where skew crossings are necessary, of keeping the angle as small as possible. An angle over 45 deg. is objectionable and one over 60 deg. should never be used. The fact that the direction of the channel can often be changed at small cost should be remembered. Frequently embankment material is needed, which will justify an extensive channel improvement.

Spur Roads—When main roads bypass cities, branches or spur roads into the city should be built at the same time and of equal design and construction. This was set down as a rule by the committee headed by Charles F. Boehler, engineer of design, Michigan highway Department.

Allowable Grades—Discussing the interrelation of economics and safety in alignment and grades, C. H. Purcell, state highway engineer of California, stated that under normal conditions high gear will carry heavy trucks efficiently up maximum sustained grades of about 3 per cent. Automobiles will similarly operate up 7 per cent grades. Reduction of sustained grades less than 3 per cent is seldom justified by fuel economics on the composite vehicle. Between 3 and 7 per cent, heavy trucks suffer losses in lower gears and lost time, which the lighter vehicles do not. For automobiles only, reduction in grade below a maximum 7 per cent is justified more by other conditions than by fuel consumption. Grades in excess of 7 per cent become disadvantageous to all vehicles for so many other reasons than fuel consumption that 7 per cent appears to be a conservative allowable maximum for highway practice, and 6 per cent is a preferable maximum for general use; for sustained grades 5 per cent is a desirable maximum on first-class roads.

Low-Cost Road Design and Construction

A study in four parts by C. N. Conner, engineer executive, A.R.B.A., of low-cost road construction, included financing and planning, grading, surfacing and bridges and culverts. Chief interest existed in the parts on financing and bridges.

Financing—Highways of general motor uses should be financed by the users through gasoline taxes and motor-vehicle license fees, and local roads should be financed in part by local taxes or special assignments. Where there is urgent need and a fixed income exists, bonding is recommended, and afterward use of current funds. Highway districts and townships should be eliminated as highway supervising units; administration should be by county highway engineering departments. State-aid systems, which should comprise county trunk-line systems, should be financed by state and local funds under state supervision.

In conclusion, the report stated that there is a large unnecessary mileage of rural highways on which funds are spent uneconomically. Probably there is an excess mileage amounting to double the necessary mileage in some states, which could well be abandoned, and the smaller system properly located would give access to the same population. The concentration of funds on smaller mileage would liberate huge sums of maintenance money, which could be spent more usefully on grading, drainage and low-cost surfacing.

Bridges—In bridges the present trends in practice are: (1) Existing bridges are being widened and new bridges are being made from 4 to 10 ft. wider than in 1928. (2) Bridges are being built with the grade line on a long radius camber curve, giving longer sight distance and good riding conditions. (3) Steel I-beams are being used more (*a*) in the place of pony-truss spans in lengths up to 90 ft. by splicing for continuity, due to the availability of 33- and 36-in. sections, and (*b*) in place of concrete and creosoted timbers because of the low prices of steel, and (*c*) in place of plate girders because of less shopwork and neat appearance. (4) Concrete floors are replacing timber on all except bascule spans, roadways are being made 24, 30 and 40 ft. wide for two, three and four lanes, and raised curbs and stronger rails are being used. (5) Live loads have been increased from 15- to 20-ton trucks and clearance heights from 14 to 15 and 16 ft.

Surfacing and Grading—In regards to surfacing, the report called attention to the field for development in road-building equipment. Heavy grading, it was pointed out, has become with modern equipment much less an obstacle than formerly.

Snow Removal

Seven recommendations as to snow removal and equipment were sent to the board of directors for adoption. W. F. Rosenwald, maintenance engineer, Minnesota state highway department, is chairman of the committee. The principal factors are as follows:

Attachment features and hitches for plows should be standardized for interchangeability. All equipment should be fitted with cabs tightly built and properly ventilated, and heated by other than exhaust heaters, if possible, to reduce the liability of gassing.

Traffic hazards should be reduced by emphasizing the location of protruding wing and blade ends by markings and floodlighting at night. The personnel should be selected from the permanent maintenance force, and the operators should be required to erect suitable marking of obstructions such as headwalls prior to the snow season.

Snow-removal programs should be accompanied by measures to prevent icy or slippery conditions, using mechanical or other means; sand, slag or cinders saturated with calcium chloride in 35 per cent solution is a practicable method used in Pennsylvania. Snow fences should be used. Standardized cost systems should be adopted.

Airport Drainage and Surfacing

Discussion of airport drainage and surfacing, particularly as these elements differ by reason of being associated with airports, occupied a full session, but without conclusions. A special research engineer of the A.R.B.A., Fred E. Schnepfe, presented a summary of comprehensive studies cooperatively undertaken by the aeronautical branch of the U. S. Department of Commerce, the American Engineering Council and A.R.B.A., under the leadership of Harry H. Blee, director of the aeronautical development in the department of commerce. A nationwide inspection of airports has been made, as well as an analysis of answers to a questionnaire to airport managers and to 100 local engineering committees of A.E.C. Some of the points covered by Mr. Schnepfe and various engineers, superintendents of airports and managers follow:

Grading must assure a free flow of surface water to intercepting drains without erosion and without causing shadows from floodlighting used. About 2 per cent is the maximum grade permissible. By drawing tentative contours at 1-ft. intervals, then making cross-sections of the land with lines from the light source (best placed 7 ft.

above ground), adjustments can be made of the light locations or of grades to eliminate shadows which appear as chasms to the aviator.

Drainage of the surface runoff to the sub-drainage system or to a separate stormwater system is a moot question. Many admit that the collection of surface water by gravel- or stone-filled trenches over the collection system is but a makeshift, since the scattering of the granular material in the trenches at the transition strip over the runway by tail-skids and propellers is a hazard and heavy expense to brush back to place. Some fields, as at Columbus, Ohio, are successfully using bituminous cinders on larger stone to prevent scattering. Experiments have been made to determine the ability of stone-filled trenches and perforated pipes to carry away various intensities of rainfall. Inverted crowns on runways and collection at the center through-grated inlets have been tried to eliminate the transition-strip ditch. At St. Louis a wide shallow swale only a few inches deep is provided at the transition strip.

Surfacing of satisfactory nature appears not attainable, at least for the older planes with tail-skids. Resilient and pliable surfaces to reduce landing impact and still soft enough to make the tail-skid effective can hardly be durable, offer low tractive resistance and do not suffer damage. The problem is being lessened by reason of the rapidly increasing use of brakes and the elimination of tail-skids. Pliable quantities will then be less essential.

Impact is still unknown as to amount. Hence the rational design to resist it is in the making. Important factors are tire equipment and shock-absorbing devices separating sprung and unsprung impacts. If these be simultaneous, it was pointed out, their effect must be additive and vary from 1.1 to 3.4 times the dead weight, depending on the deceleration. However, in the discussion there seemed to be much ground for the assumption that the punishment is no greater than highways receive from motor traffic.

Surface textures sufficiently rough to prevent skidding when wet, and smooth enough to prevent excessive wear on the tires when landing, are the limiting conditions with which compromise must be made. Broomed concrete and controlled aggregate are methods used in bituminous types.

City Paving

Unemployment problems, paving practice in 150 cities, assessment methods, maintenance methods and street capacity were topics covered with an unusual amount of discussion from the floor at the two well-attended sessions of the city officials' division, presided over by C. E. Myers, director of transit, Philadelphia.

Unemployment relief by public works construction, accelerated by funds expended for needed work, was urged on the engineers. Early preparation of plans and urgent insistence on use of regular accelerated programs already budgeted was the line suggested.

Assessment practice in seventeen representative cities was ascertained, and the following tentative recommendations made: (1) That city officials retain discretionary power in the selection of type; (2) that the city pay for intersections; (3) that the city pay for excessive widths; (4) that contractors be paid in cash; (5) that repaving of surfaces twenty years or more old be done by general assessment of less age by the city.

Maintenance was studied by Staff Engineer C. R. Thomas, who visited twenty cities and collected data from a comprehensive questionnaire on surface cuts, cleaning, resurfacing, salvaging and improving streets. A wealth of information for the city engineer and street superintendent resulted and is to be put in bulletin form. A. T. Rhodes, superintendent of streets and sewers, Leominster, Mass., is general chairman. Typical conclusions reached are as follows: More attention should be paid to repair methods to allow quick resumption of traffic. Public utilities should be installed before paving, but a healthy growth prohibits restriction against opening streets for connections. A really successful machine is needed to cut down ice traffic ridges. Excessive crowning of unpaved streets is dangerous.

Traffic capacity of streets was covered in a series of five recommendations. Best widths given were indicated as made up of 10-ft. traffic lanes and 9-ft. parking lanes. The danger of using the wider street for an odd number of traffic lanes should be eliminated. A speed of 23½ miles per hour will produce the maximum capacity with reasonable safety. Routing traffic off light residential streets was suggested as practicable by the means of weight-limit signs. Kansas City collects for street destruction. Mr. Rhodes allows one-sixth the width of the street for sidewalks.

Contracting Problems

Two sessions devoted to contracting brought out discussions on future highway programs, state aid to counties, and prison labor. W. C. Markham, Stanley Abel and C. E. Myers, speaking respectively of state, county and city work, indicated promising activity in all classes of road and street construction.

Basing calculations on expenditures and men employed in state road construction in 1929, W. H. Markham gave the following figures:

1929	Expenditures	Men Employed
1929 (verified)	$730,000,000	300,000
1930 (close estimate)	850,000,000	350,000
1931 (rough estimate)	950,000,000	390,000

These figures include only money actually expended for work directly employing labor.

Discussing prison labor, Woolsey Finnell, director of the Alabama highway department, stated that it is impossible under the best conditions for an engineer to have work done as satisfactory with prisoners as with free labor. Under the conditions imposed on contractors, prison labor cannot compete in cost. A general discussion on the future of contracting was participated in by A. R. Losh, state highway engineer of Oklahoma; Allen J. Parrish, general contractor; Richard Deming, American Surety Co., and W. F. Gephart, First National Bank of St. Louis. A review of the work of the bureau of contract information was presented by S. M. Williams, president.

Special Reports

Four reports, each of which constitutes a virtual monograph on its subject, are reserved for special mention in conclusion. They are the report on subgrade and pavement bases by James S. Burch, assistant engineer, A.R.B.A.; embankment consolidation, by P. F. Seward, assistant engineer, A.R.B.A.; railway grade crossings and highway intersections, by a committee of road, railway and bridge engineers, with R. H. Baker, state highway commissioner of Tennessee, as chairman. Highway guard-rail, by C. N. Conner and J. P. Cockey, engineer executive and assistant engineer, A.R.B.A.

Earthwork 73 Per Cent Complete on Dallas Levee Project

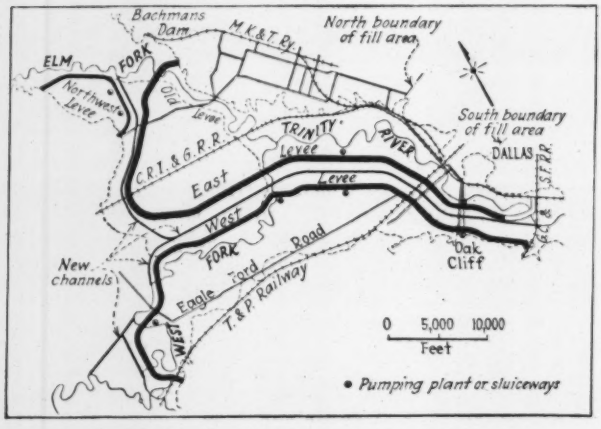
OUT OF A TOTAL of 16,262,337 cu.yd. of earthwork involved in the construction of the Dallas Levee Improvement District, 11,926,770 cu.yd., or 73 per cent, had been placed by October, according to a report issued by Myers, Noyes & Forrest, consulting engineers on the project. Contracts for the levee work total $4,289,300, and estimates amounting to $2,821,965 have been paid on these contracts. The accompanying map shows the extent of the completion of the levees and new river channel. The reclamation project was described in *Engineering News-Record*, Nov. 21, 1929, p. 804. In addition to providing flood protection for the city, the project reclaims 9,940 acres of land for industrial purposes.

The west levee is entirely complete, with the exception of a gap at Commerce St. Traffic has now been diverted over the new Commerce St. viaduct, and the final closure in the levee will soon be made. The east levee is complete from its upper end to the Texas & Pacific Railroad, with the exception of one opening left for the construction of the Dallas branch pressure sewer outlet. The section of the east levee between the Texas & Pacific Railroad and Commerce St. is practically complete. Below Commerce St. about 2,000 ft. of the east levee still remains to be constructed. Delay in starting this section has been caused by the presence of a power line. Rights-of-way for new power lines to replace those in the way of the levee have been granted, and this last section of levee is expected to be completed early in 1931. The concrete wall at the lower terminus of the east levee has been completed and the gate structures at the railroad crossings have been provided. The northwest levee is complete in its entirety. All of the new river channels have been opened up.

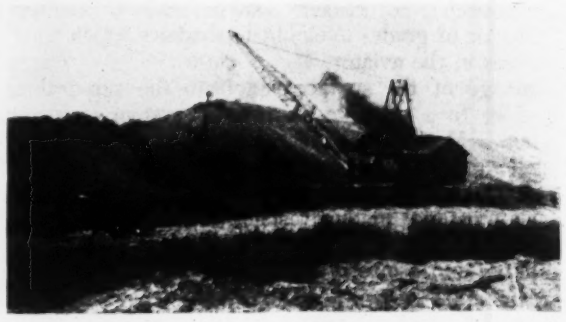
All of the floodway within the district proper has been cleared of timber and obstructions. All pumping plants have been completed and are now ready for power connections. The location of these plants is shown in the accompanying map.

The hydraulic fill at Commerce St. is now complete, and the dredge is filling in that portion of the old river channel below the Texas & Pacific Railroad. The Coombs Creek retention basin levee and storm-sewer outlet are completed.

The above covers the work being done by the Levee Improvement District. Progress of construction work being done by others in connection with the flood control and improvement work is as follows:



Status of Dallas levee improvement in October



Diesel dragline at work on Dallas levee

County of Dallas—The county has completed four long viaducts at Corinth, Cadiz, Commerce and Lamar and now have under construction the fifth one at Irving Road. A low-water crossing has been constructed at Hampton Road, and a similar one is now under construction on Westmoreland Road. A contract has been awarded for the grading and drainage structures on Industrial Boulevard from its intersection with Corinth St. to a connection with Turtle Creek Boulevard. This is part of a new boulevard to run through the entire length of the reclaimed area on the Dallas side of the east levee.

City of Dallas—The city is progressing with the storm-sewer work occasioned by the reclamation improvement. Water mains are being laid to serve the reclaimed area, and water-line changes in other districts made necessary by the improvement work are under way. The Cadiz St. underpass is now under construction, and work will soon be under way on the Lamar St. underpass.

Railroads and Utilities—All gas and oil lines that formerly traversed the floodway have been reconstructed to pass over the levees and under the new channel. Ten miles of power line have been removed and are being replaced by 20 miles of new line. Three miles of telephone and telegraph lines have been rebuilt.

The Rock Island Railroad has built a new trestle 1,500 ft. long over the northwest section of the floodway, also completed 1½ miles of grade revision. The Texas & Pacific Railroad is constructing a double-track concrete and steel girder bridge 2,000 ft. long, necessitating more than a mile of grade revision. The Northern Texas Traction Co. is building a concrete and steel girder single-track bridge 2,000 ft. long and revising a half mile of grade.

Heavy Loads Damage Indiana Roads

Serious damage to Indiana highways by heavy loads is reported by John J. Brown, director of the state highway commission. It is stated that while the Indiana law permits an axle load of 22,400 lb., which is much higher than is allowed in most other states, many operators haul loads far beyond even this limit and in fact limit their loads only by the capacity of the trucks. A case is cited where a public utility company hauled a transformer with total weight of 42 tons on truck and trailer, although permission to haul this excessive weight had been refused by the highway authorities. Subsequent investigation of the concrete road showed 70 cracks or breaks per mile for a distance of 4¾ miles, while beyond this route the cracks were only 27 per mile.

Basis Outlined for Agreement Between Engineers and Architects

Joint committee representing the national architectural and engineering societies recommends principles upon which to base a mutually satisfactory solution of the present points at issue between the professions

A SET OF PRINCIPLES which, if put into effect, should aid in ending the controversies which have caused strained relations between the architectural and engineering professions has been submitted to four of the national societies of the two professions by a joint committee appointed for that purpose.

For some time past, relations between the two professions have been far from satisfactory. At several points throughout the country there has been open warfare. The points at issue have been reviewed in detail in these pages in the past. They found their origin in the fact that modern developments in building design have brought more and more engineering into architectural work until there has grown up a class of engineers whose principal practice is in the building field, chiefly in the design of large office buildings, hotels and apartment houses.

Many architects have viewed this development with growing concern. Within recent years some of them have attempted to place a check upon it through the enactment of new laws or by interpretations placed upon existing ones. In New York State their efforts resulted in the writing of a restrictive clause into the multiple-dwelling law, designed to exclude engineers from that field; also in an interpretation of the architects' practice act, which for a time prevented engineers from filing any building plans in New York City.

These two developments were so widespread in their effect that they brought the matter to a head and ultimately resulted in setting up the joint committee which has just submitted its report.

The committee was made up of J. Riley Gordon, C. Herrick Hammond, John Hall Rankin and D. Everett Waid as representatives of the American Institute of Architects, and Willard T. Chevalier, Robert Ridgway, Harry A. Kidder and F. A. Molitor as representatives of the American Society of Civil Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

Committee Report

The report of the committee is given in part herewith. Outside of the general principles laid down it concerns itself chiefly with the model uniform registration law for engineers and the proposed model law for the registration of architects. For that reason several sections of the report are given in abstract as the recommendations made therein refer to detailed changes in those laws.

The joint committee, appointed by your several societies to consider and report upon legislation regulating the practice of architecture and engineering and upon allied matters of common interest to both professions, submits herewith a report of its findings and recommendations.

The committee has sought first to establish a common ground of principle upon which the members of both professions may stand in considering and advocating legislation that might affect their relations with each other and with the general public they both serve.

It has tried also to formulate suggestions as to how these principles may be embodied in the model registration laws now sponsored by the national architectural and engineering societies.

Finally, it has considered how the members of both professions, both as individual citizens and through their several organized groups, can best bring their influence most helpfully to bear upon specific legislative action that may be in hand or in prospect.

The conditions and principles accepted by your committee to govern its recommendations are as follows:

1. In considering the professional practice of the architect and the engineer there is of necessity a certain overlap between the functions and responsibilities of the former profession and those of certain groups of the latter.

2. With the growing need for more engineering in architecture and more architecture in engineering, it is becoming increasingly difficult to draw sharp lines to define this overlap and more necessary to establish and maintain cordial and sympathetic cooperation between the two professions.

3. Within the ranks of the professions themselves such cooperation will be developed and fostered out of the sense of professional responsibility felt by every professional man toward his client; that is to say, architects may be relied upon to call in the services of engineers, and engineers likewise may be expected to enlist architectural services when desirable.

4. On the other hand, the drafting of laws needed to regulate professional practice, makes it necessary to define the scope of the professions and to describe the essential qualifications of their practitioners more precisely than might otherwise be necessary.

5. In considering legislation to regulate the practice of the architectural and engineering professions, it must be accepted as basic that such legislation finds its justification in the police power of the state, exercised to guard the safety and security of the life, health and property of its citizens.

6. A lack of esthetic quality in the design of buildings may seriously injure their commercial value, and the "safety and security of property" may be jeopardized as truly by bad esthetic design as by unsafe structural design. A deteriorating effect on property values due to bad design, especially of exteriors exposed to general view, will be recognized as of increasing importance with the growth and cultivation of public taste. This fact leads your committee to emphasize the great importance of fostering a feeling of interdependence between the professions of architecture and engineering and a realization of the need of proper collaboration on most building operations.

7. In drafting laws it has been found relatively easy to define the scope of the architect's qualifications and practice, but those of the engineer, as set forth in many of the existing registration laws, are so broad and diversified as to require in certain respects more detailed definition in the interest of law-makers and the lay public. At the same time, the mem-

bers of both professions recognize the essential unity of engineering science and practice and endorse the efforts of the engineers to maintain the solidarity of their profession and to resist any tendency to break it down into separate groups.

8. To this end your committee approves the policy of having one general registration for professional engineers, just as there is a similar general registration for architects, and recommends that any differentiation between engineers required to meet the needs of law-makers and of the public be effected by the requirement of special qualification under the basic registration laws rather than by the establishment of separate groups under special legislation.

Subsequent paragraphs of the report contain recommendations as to specific changes in the model uniform registration law for engineers and land surveys. The first is that to the definitions of professional engineer and land surveyor contained in that law the following be added:

The term "professional engineer" qualified by the adjective "structural," when used in this act shall mean a professional engineer who represents himself as competent to design or supervise the construction, enlargement or alteration of structures, or any part thereof. The term "structures" within the meaning of this act denotes all structures having as essential features foundations, columns, girders, trusses, arches and beams, any or all of these and/or other parts, in which safe design and construction require that loads and stresses be computed and the size and strength of parts be determined by mathematical calculation based upon scientific principles and engineering data; and these shall include such structures as may be covered by the term "buildings," as defined in any act enforced in this state regulating the practice of architecture.

This is followed by a recommendation that there be added to the section of the law outlining the general requirements for registration a subsection stating that for the "professional engineers (structural)," as provided for in the section given above, there shall be presented "such evidence as may be satisfactory to the board that the applicant is competent to be placed in responsible charge of design or supervision of the construction, enlargement or alteration of structures as defined in section 2" (given above).

Further changes in the engineers' model law proposed by the committee are a provision for the addition of a seal for the "professional engineer (structural)" and a rewording of the paragraph relating to public works, to make it clear that it is not intended to restrict the practice of architects. Saving clauses for architects in the engineers' law and for engineers in the architects' law also are proposed. The proposed saving clause for the architects' law reads as follows:

Nothing in this act shall be so construed as to restrict the right of registered professional engineers whose certificates indicate their proficiency in the structural branch of their profession, to design, file plans for, and supervise the construction, enlargement or alteration of buildings and other structures.

Continuing, the committee makes the further statement:

The purpose of the amendments to both acts here proposed is to define those special qualifications which should be possessed by an engineer who holds himself out as competent to engage in the practice of architecture in so far as that practice may affect the safety and security of life and property.

We recommend, therefore, that the individual members of our two professions and our various societies, both national and local, should work for the general adoption of registration laws conforming in spirit with the model and uniform laws now endorsed by our national societies with the amendments here proposed and for the amendment of existing registration laws to conform as closely as practicable thereto.

We recommend further that in bringing the influence of our two professions to bear upon legislation affecting building design and construction and the practice of architecture and engineering, the principles herein laid down be observed.

As an aid to continued harmonious cooperation, we recommend that no architects or engineers, either individually or through their respective societies and other groups, should undertake to influence legislation affecting the practice of the other professions without first consulting with recognized representatives of that profession.

There is great need, in the interests of the public, to promote and foster sound legislation for better and safer building. This need is a challenge to both our professions, and to meet it we shall require the most intelligent and wholehearted cooperation. Our interests in this respect are common and closely interwoven, and if we are to make our efforts count for genuine progress it will be necessary for us to avoid conflicting representation to legislative bodies and to maintain close cooperation and unity of effort.

With all these considerations in mind, your committee presents these findings and recommendations in the hope that they will have the endorsement of architects and engineers both individually and through appropriate action by their several organized groups.

Legal Phases of Beach Protection in California

WHAT RIGHTS a property owner has in the matter of building groins and other beach-protection works along the ocean shore in southern California is the subject of a study now being made by a committee consisting principally of Los Angeles engineers. Now no state body has the power to grant permits for erecting structures along the beaches seaward of high-tide line. The state attorney general has ruled that groins constructed on the ocean beach near Santa Monica are "purprestures" on state land, are a nuisance, and must be abated. He has agreed, however, to withhold enforcement of this ruling a while to see whether a joint engineering committee is able to work out some means of constructing groins which will not obstruct the beach to pedestrian travel.

Such a joint committee has been formed by the various interests involved, in the realization that not only private property, but cities, counties and state are concerned. The nucleus of this committee is an "advisory board on beach protection," with the following executive committee: Charles T. Leeds, consulting engineer, chairman; Harold Conkling, deputy state engineer; S. V. Cortelyou, division engineer (Los Angeles division), state highway commission; J. E. Rockhold, Los Angeles County surveyor; and Wilkie Woodard, consulting engineer representing private property owners.

The various interests concerned are cooperating in study under two main subdivisions: (1) a factual review under the heading "historical"; and (2) a collection of ideas and opinions of the committee and others bearing on (a) the best means of improving and protecting the beach frontage; (b) how present groins may be made more effective; (c) how they may be made less unsightly; (d) how they may best be modified to prevent their constituting an obstruction to public passage.

A "seacoast committee" of the state legislature has been instructed to make recommendations at the next legislative session regarding the best development of the natural resources of the land and water areas contiguous to the coast line "in the furtherance of navigation, commerce, fisheries, and the production of minerals and oil, and for residential, recreational and scenic purposes."

LETTERS TO THE EDITOR

Flow of Water Around Bends

Sir—Referring to the letter by William D. Mitchell and L. Harrold in the Nov. 6 issue of *Engineering News-Record* regarding flow of water around bends, I submit the following explanation of the difference in water surface elevation between two points in the same cross-section.

Consider any particle of water flowing past the section. For a short distance along its path we may assume that its velocity is constant. For all practical purposes we may also assume that for a short distance the curvature of the stream is constant. We then have a particle of water flowing past the section with uniform circular motion. In order to cause this particle of water to follow a curved path some accelerating force must be applied. (It will be noted here that the acceleration, or change in velocity, experienced by the particle is in *direction* rather than in magnitude.) This applied accelerating force must be radial and directed inward to balance the opposing centrifugal force of the particle.

Let the mass of the particle of water be represented by $wdAdr$ where w = density of water in pounds per cubic foot, dA = an element of area perpendicular to the radius, and dr = an elementary length of radius. It can be shown that radial acceleration = $\frac{v^2}{r}$ where v = velocity of the particle in feet per second and r = the radius to the particle in circular motion.

The centrifugal force of the particle then = $wdAdr\,\frac{v^2}{r}$ (in poundals) = $wdAdr\,\frac{v^2}{rg}$ in pounds. Now, in order to balance this centrifugal force of the particle (directed radially and outward), we must have a difference in pressure between the inner and outer faces of the particle equal to this centrifugal force and directed radially and inward.

We then have $dP = wdAdr\,\frac{v^2}{rg}$ where dP = this difference in pressure (or force). This pressure dP is distributed over the area dA. So, if we let p = intensity of pressure in feet of water, $dP = wdpdA = wdAdr\,\frac{v^2}{rg}$, or, $\frac{dp}{dr} = \frac{v^2}{rg}$.

If we choose a particle of water at water surface with known velocity and radius it will be seen that $\frac{dp}{dr}$ = the tangent of the angle the water surface makes with the horizontal.

If the mass passing the cross-section were a solid instead of a fluid, the velocity of a particle at any distance r from the center of the circle would be a known function of the radius r, and its velocity could be expressed as wr (where w = radians per second). Then $\frac{dp}{dr}$ would be equal to $\frac{w^2r}{g}$ and dp would equal $\frac{w^2rdr}{g}$. The total difference in elevation $p = \frac{w^2}{g}\int_{r_1}^{r_2} rdr$ could then easily be found by integration.

However, with a fluid, like water flowing in a river, the character of the streambed, effects of friction, etc., affect the flow of individual particles to such an extent that any practical mathematical relationship between v and r would be impossible.

However, if water surface velocities are known across a section at enough points so that $\frac{dp}{dr}$ will be practically constant from one point to the other, the total difference in water surface elevation can be determined from the use of these observations.

If we assume that the radius length to station 100 (in the cross-section referred to) is equal to 100 ft. and compute $\frac{dp}{dr}$ at station 100 and at 10-ft. intervals thereon to station 40, the results will be as follows:

At sta. 100	dp/dr	$\frac{(1)^2}{100\times32.2}$	= 0.0003
At sta. 90	dp/dr	$\frac{(2.5)^2}{100\times32.2}$	= 0.0018
At sta. 80	dp/dr	$\frac{(6)^2}{120\times32.2}$	= 0.0093
At sta. 70	dp/dr	$\frac{(8)^2}{130\times32.2}$	= 0.0153
At sta. 60	dp/dr	$\frac{(10)^2}{140\times32.2}$	= 0.0222
At sta. 50	dp/dr	$\frac{(11)^2}{150\times32.2}$	= 0.0250
At sta. 40	dp/dr	$\frac{(12)^2}{160\times32.2}$	= 0.0280
	Total		0.1019

$10 \times 0.1019 = 1.019$ ft., which added to the gage height of 8.1 ft. at station 100 gives a gage height of 9.1 ft. at station 30. This computed value is 0.3 ft. lower than the observed gage height.

I would be interested in knowing how close the assumed value of $r = 100$ ft. at station 100 is to the actual value.

Kansas City, Mo., Nov. 29, 1930.

DELBERT B. FREEMAN,
Junior Hydraulic Engineer.

Cost a Major Factor in Undercrossings

Sir—In your issue of Nov. 20, p. 821, there appears Mr. Wendell's reply to Mr. Ray on the question of center columns for undercrossings. He appears to make a very strong case, but I desire to call attention to some points which may have more than one viewpoint. Where the condition exists, as cited by Mr. Wendell, of 85 per cent of the traffic going in one direction in the morning and the opposite direction in the evening and a four-lane roadway taking care of this traffic (85 per cent of 4 is more than 3), it is certainly absolutely necessary for safety to mark off the lanes and prohibit the cars from crossing into the other lanes; otherwise, cars running counter to traffic would be darting out into the opposing lanes. But with cars running in lanes, what difference does it make if a car follows a line on the other side of a row of columns from that of the car on the adjacent lane? Where would slowing up of traffic occur? The railroad advocating the center columns or piers does not claim to restrict the direction in which traffic shall go on either side of these columns or piers.

As a matter of fact, the condition Mr. Wendell cites is chiefly found to occur on Sundays and holidays, and the traffic consists chiefly of pleasure cars which require no more than about 8 ft. for their lanes, so that a provision of two 24-ft. roadways would be more than ample for these bridges if Mr. Wendell wishes to restrict the vehicles to one side of the columns. Moreover, this type of traffic certainly does not use all the streets of a suburban town or city. Only one or two streets would be subject to the condition above mentioned. Yet Mr. Wendell would establish a policy which would compel the installation of clear spans for all undercrossings in a grade-crossing elimination project through such a city.

On the question of grades, the use of girderless flat-slab bridges with columns on the center line and along the curbs results in a reduction of required floor depth of from 1 ft. 0 in. to 1 ft. 6 in., which can be used in reducing the approach grades to the underpass and minimize the danger due to excessive grades.

A car that swerves into the center column might well hit another car coming in the opposite direction if there is no center column and thus double the amount of damage and loss of life. Cars occasionally hit telegraph poles and lamp standards, but I do not hear of anybody advocating the elimination of these sources of danger to the motorists.

Mr. Wendell's attitude, as frankly stated, is from the highway engineer's viewpoint and particularly from the view of the motorist. We on the railroad have to consider

both the railroad and the highway viewpoint, and we try to think also of the pedestrian who may use the highway. To cite an instance: since 1920 we have made a practice in overhead highway bridges to design the structure with curbs 12 to 15 in. high to prevent a car from mounting these curbs, injuring pedestrians or hurtling off the structure. The department of public works objects to these high curbs on the ground that these interfere with running boards of the cars, which with low curbs may protrude over the curb on the sidewalk. Has it ever occurred to the department that a pedestrian may be walking close to the curb and be injured under such conditions?

But coming back to the underpass, the question of cost cannot be passed over as lightly as Mr. Wendell seems to imply. In the end the whole public may pay for it, but until that end is reached a very small portion of the public suffers for that excessive cost. When a railroad goes into receivership only a small portion of the public has to curtail expenses and change its mode of living.

As it is, the railroads are investing capital for roadbed for their competitors, the buses and freight-carrying trucks, when they build or contribute to the building of highways, toward the cost of which these competitors contribute exactly nothing.

M. HIRSCHTHAL,
Concrete Engineer,
D. L. & W. Railroad Co.

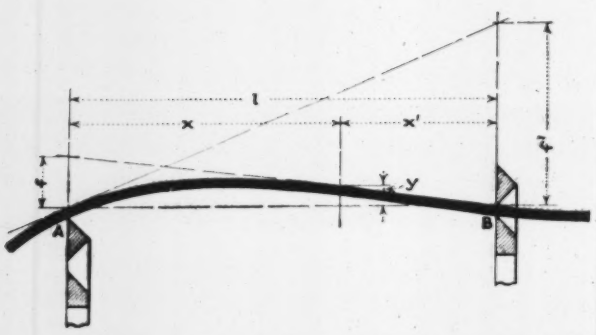
Nov. 25, 1930.
Hoboken, N. J.

Mechanical Methods of Stress Analysis

Sir—C. B. McCullough's article in *Engineering News-Record*, Sept. 25, 1930, p. 489, deserves the favorable comments with which you introduce it. In this introduction you state that the theorems with which Mr. McCullough so ably shows how mechanical methods may be explained from the point of view of abstract statics, "are the theories upon which all the types of analysis equipment are based." This view is shared by technical authors generally, and it is, to my mind, of greatest practical interest that the real nature of mechanical analysis be properly explained upon concrete grounds.

In mechanical methods we essentially displace or distort one part of a structure, causing all of its members to distort, forming curves which are the influence lines of those stresses, which tend to produce the originating geometrical (linear or angular) displacements and which we want the structure to resist.

The curves are geometrical units of definite shape, and easily analyzed. For example, a straight member of a structure, of constant section AB, represented by a spline of elastic material, bent by displacements at sections beyond A and restrained at B, as shown in the accompanying figure, will form a curve, the ordinate y of which is $y = xx'\ (xf + x'f')/l^2$. This is the general equation of influence lines. The tangents f/l and f'/l at B and A respectively naturally vary directly with the geometrical extension of the originating displacement and indirectly with their relative stiffness, which again depends upon the position of AB within the structure and upon the section stiffness; the latter is being assumed beforehand, the same as in abstract statics.



Displaced member assumes shape of influence line

Thus we see mechanical analysis theoretically operates with geometrical units only, especially with simple curves and does not require abstract stress functions as an explanation. On the contrary, we should look upon mechanical methods as the logical, natural and even beautiful experimental base, that is to make statical theory far more simple and efficient than it is now.

OTTO GOTTSCHALK,
Consulting Engineer.

Buenos Aires,
Dec. 4, 1930.

Power From Falling Sewage

Sir—The article "Spiral Dropshafts 100 Ft. Deep on St. Paul Sewers," by C. M. Colestock, in *Engineering News-Record* of Dec. 18, 1930, certainly describes a novel way of dissipating energy of falling sewage.

Such a large volume of sewage as 1,400-1,900 sec.-ft. falling 100 ft. could generate from 12,700 to 17,200 hp. and at the same time would reduce the velocity to less than 3 ft. per second. The power, although fluctuating, could be used for air compression, which in turn could be utilized in treating sewage or for other purposes. The shaft drop would be ideal for operating any hydraulic air compressor or reversed airlift, which type of apparatus could be constructed at a low cost. The sewage would have a discharge velocity of $\frac{3}{4}$ ft. per second. Aeration of the sewage, even if not complete, would certainly be beneficial for partial activation or for freshing stale sewage and washing out H_2S gas and odors caused by purines, particularly the amino-purines. In the writer's practice, a specially designed fall of 8 ft. has been utilized to aerate and shatter sewage solids, also to dissipate kinetic energy of about 1 hp.

Sewage hydro-electric plants are operating satisfactorily, and where the main capitalized cost of construction can be charged off against the sewage works they have proved economical.

H. L. THACKWELL,
Consulting Engineer.

Jacksonville, Tex
Dec. 29, 1930.

Improving Harbor Design

Sir—In looking over your editorial on "Improving Harbor Design" in *Engineering News-Record* of Dec. 4, 1930, p. 872, it occurs to me that probably the parallel piers at the entrances of Lake Michigan harbors had some function as jetties, carrying the dredged or scoured river channel across the bar or zone of river mouth deposit. With the new construction this zone tends to remain undisturbed and therefore more dredging may be required to maintain the channel; in fact the dredging must be over a wide area because of the latitude given to the movement of the entering vessel. If so, this type of harbor would be adapted mainly to cases which warrant frequent maintenance dredging.

HARBORS.

Inquiry as to conditions at Lake Michigan harbors indicates that the parallel-pier type of harbor entrance does not function to maintain deep channels by the scouring action of currents from the rivers. These existing deep channels represent a considerable enlargement of the original cross-sections of the rivers, so that the velocity of current is greatly reduced as compared with the natural condition. Harbor improvements at these ports generally extend considerable distances up the river so that the sedimentation ground for the river discharge is a considerable distance upstream from the piers at the entrance. Furthermore, the rivers in the district mentioned carry a relatively small amount of silt as far as the harbors, and there has been little shoaling due to river sediment. The greatest amount of shoaling at harbors of any kind is due to eddies and currents set up in the lake during severe storms, which generally form shoals at and near the harbor entrance. In fact, as a general rule the arrowhead type of harbor is found to cause less shoaling at the entrance and through the inner channel than is the case with parallel piers, notwithstanding that the channel through the arrowhead harbor is generally much wider than was the channel between the parallel piers.

EDITOR.

NEWS OF THE WEEK

Current Legislative Matters Considered by Engineering Council

FOR the purpose of indicating and promoting measures tending to balance the forces of consumption, production and distribution, American Engineering Council, at the annual meeting of the Assembly in Washington Jan. 16 and 17, authorized the executive committee to undertake as soon as funds can be obtained a broad survey to coordinate the facts on the important points of attack, which were outlined as:

(1) Maintaining or increasing the consumption of goods and services; (2) balancing plant, machinery and processes against production demands; (3) balancing distribution agencies against consumer requirements; (4) balancing man power against production and distribution demands; (5) controlling money and credit to satisfy the needs of government, business and the individual; (6) encouraging research activity to increase human well-being through development and progress in industry and business; (7) balancing public works against public need. It is estimated that this survey would cost between $100,000 and $200,000.

Council indorsed the navy department's plan for a new naval towing tank along the Potomac in the vicinity of Cabin John bridge, near Washington. The naval appropriation bill now before the House appropriations committee includes $3,000,000 for this project and Council will appoint a special committee to render practical assistance in obtaining enactment of this legislation.

No Decision on Prequalification

The Assembly authorized appointment of a representative on a joint committee on prequalification of contractors that is being formed by interested national organizations, but declined to express any opinion at this time as to the advisability of prequalification. This joint committee is intended to act as a clearing house of information upon the subject.

Council will take up with the Society of Naval Architects a suggestion by President Grunsky that the United States, in concert with other nations, adopt maximum dimensions for the length, beam and draft of merchant vessels to the end that harbor, dock and canal facilities can be properly planned.

A survey by the United States government of the water resources of the country was suggested by C. E. Grunsky, president of American Engineering Council, for the purpose of determining in the case of each river and each watershed how these resources

(Continued on page 166)

Model Prequalification Law to Be Studied by A.G.C.

In response to numerous requests from all parts of the country for a guide in framing such legislation for immediate introduction, a model law for the prequalification of prospective bidders on public work will be submitted for consideration at the annual convention of the Associated General Contractors of America at San Francisco next week. The law would require all persons or firms, before being permitted to bid, to file satisfactory evidence that they possess the necessary ability, capital, equipment and experience to perform the contemplated work. In principle the model prequalification law has already been adopted in fourteen states and numerous municipalities.

The model bill was drawn by Harry J. Kirk, former director of highways of the State of Ohio and under its provisions awarding officials, after receiving properly executed questionnaires from prospective bidders, would classify these contractors as to the character and amount of public work which they appear to be qualified to undertake. Bids then would be accepted only from those qualified in accordance with such classification. Provision is included for appealing from classifications of the awarding officer and for fixing penalties for false statements on questionnaires, for conviction of which a contractor would be permanently disqualified from bidding on any work of the state.

Engineers Report On the Failure of the Corpus Christi Dam

REPORT of the engineers, Henry E. Elrod and Robert J. Cummins, appointed to investigate the failure of the dam at Lake Lovenskiold on the Neuces River, built to impound water to supply the city of Corpus Christi, Tex., has been made to the mayor and city council. Accounts of the failure were printed in *Engineering News-Record* Nov. 27, 1930, p. 861; Dec. 4, 1930, p. 897, and Dec. 18, 1930, p. 974. Failure occurred on Nov. 23, 1930. An article describing the structure and the construction methods followed appeared in the issue of Oct. 2, 1930, p. 520. The salient features of the report follow:

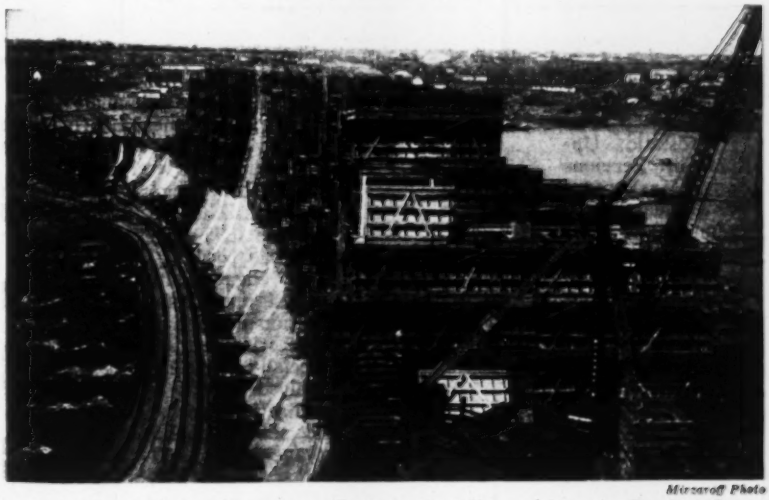
Dam Can Be Repaired

Answering the questions you asked us, we would state in the first place we believe there is no inherent reason to prevent the safe rehabilitation of the dam and its appurtenances at a not excessive cost and so permit it to be used in the capacity for which it was first intended. In the second place, we find no evidence of inferior materials or workmanship having been used in the construction of any portion of the structures.

"Based on our investigation to date, we believe the failure to have been due

(Continued on page 165)

DNIEPER POWER DAM MAKING GOOD PROGRESS



Mirzoeff Photo

Soviet Russia is bending every effort to bring to early completion its great hydro-electric power station on the Dnieper River. This is one of the outstanding projects in Russia's five-year plan. The photograph reproduced above, taken recently, shows part of the dam almost completed.

Medals and Prizes Awarded at Annual Meeting of American Society of Civil Engineers

MEDALS and prizes annually awarded by the American Society of Civil Engineers were distributed at the Jan. 21 session of the annual meeting in New York City. The awards were made for papers published in the *Transactions* during the year ending with July. The winners are as follows:

Norman Medal

CHARLES TERZAGHI, professor in the Technische Hochschule, Vienna, Austria, received the Norman medal for his paper "The Science of Foundations—Its Present and Future." Professor Terzaghi was born in Prague, Czechoslovakia, in 1883 and was graduated from the Technische Hochschule, Graz, Austria, in 1904. After five years as superintendent of construction and chief engineer on reinforced-concrete buildings and hydro-electric developments and foundations in Austria, Hungary, Croatia and Russia, he came to the United States, where he was engaged on miscellaneous construction work. In 1916 he began his educational work, becoming professor of foundation engineering in the Turkish Engineering University, in Constantinople. From 1918 to 1925 he was professor, afterward acting head, in the civil engineering department of Robert College, Constantinople. From 1925 to 1929 he was on the faculty of the Massachusetts Institute of Technology. From 1929 to date he has been professor in the Technische Hochschule in Vienna, Austria. He enjoys an extensive consulting practice in the United States and in Central America.

Croes Medal

H. DE B. PARSONS, consulting engineer, New York City, received the J. James R. Croes medal for his paper "Hydrostatic Uplift in Pervious Soils." Mr. Parsons was graduated from Columbia in 1882 and from Stevens Institute in 1884. He has been a consulting engineer in New York City since 1885 and has acted in that capacity for various departments of the city of New York. In 1892 he was appointed professor of steam engineering and in 1907 was made professor emeritus of practical engineering at Rensselaer Polytechnic Institute. In 1893 he was a consulting engineer for the Nicaragua Canal Construction Co. In 1906-07 he was chairman of the commission on street cleaning and waste disposal for the city of New York and from 1908 to 1914 was a member of the Metropolitan Sewerage Commission to report on main drainage for the city of New York. He acted as consulting engineer on the construction of the Ashokan reservoir of the Catskill water supply. He was president of the American Institute of Consulting Engineers in 1926.

Rowland Prize

The Thomas Fitch Rowland prize was awarded to RUFUS MCC. BEANFIELD, consulting engineer, Los Angeles, Calif., for his paper "Unusual Engineering Features of an Immense Theater Building." Mr. Beanfield was born in San Francisco in 1886 and was graduated from the U. S. Naval Academy in 1907, after which he was a civil engineer with the war department in the Philippines, engaged in design and construction work, and later assistant engineer in the bureau of public works, Philippine Islands, on the design of buildings and bridges. He developed and planned the complete construction plant for building the Don Pedro dam and designed and supervised the structural and mechanical work of the Shrine Civic Auditorium of Los Angeles, one of the largest theatrical structures in the world.

James Laurie Prize

JOHN H. GREGORY, consulting engineer and professor of civil and sanitary engineering, Johns Hopkins University; C. B. CORNELL, construction engineer, Baltimore, Md., and C. B. HOOVER, superintendent, division of water and sewage disposal, Columbus, Ohio, were awarded the James Laurie prize for their joint paper on "The O'Shaughnessy Dam and Reservoir."

Professor Gregory was graduated from Massachusetts Institute of Technology in 1895 and ever since his graduation has been actively engaged in the design and construction of sanitary engineering works, especially water-supply and water-purification works, and sewerage and sewage-disposal works. Since 1919, in addition to his consulting practice, Mr. Gregory has been a member of the faculty of the engineering school of Johns Hopkins University. In 19[illegible] Professor Gregory was awarded the Thomas Fitch Rowland prize for his paper entitled "The Improved Water and Sewage Works of Columbus, Ohio."

Mr. Cornell was born in Columbus, Ohio, and since his graduation from Ohio State University has devoted most of his time to the construction of water-works dams and sewage-disposal plants. From 1920 to 192[illegible] he was with the bureau of water-works extension, Columbus, Ohio, as field engineer and construction engineer on the O'Shaughnessy dam. From 1926 to 1930 he had supervision of the construction of the Mineral Ridge dam and reservoir for the Mahoning Valley Sanitary District, Youngstown, Ohio. At present he is construction engineer for the city of Baltimore on the Prettyboy dam and reservoir.

Mr. Hoover was born in Ross, Ohio, in 1881 and was graduated from Ohio State University in 1903, afterward taking special studies at Cornell. He entered the employ of the city of Columbus in 1904 and has been employed by the city continuously except during the time he was in military service. For one year he was bacteriologist at the sewage-testing station, for three years inspector of construction materials used on water and sewage-disposal works, for twelve years chemist in charge of the division of sewage disposal, for 1½ years engineer in charge of the bureau of water-works extension, and from December, 1921, to date superintendent of the divisions of water and sewage disposal.

Wellington Prize

GEORGE GIBBS, consulting engineer, New York City, was the recipient of the Arthur M. Wellington prize for his paper "The Virginian Railway Electrification." Mr. Gibbs, who was born in Chicago in 1861, was graduated from Stevens Institute of Technology in 1882. His most important achievements have been in the railway field, he being the inventor of numerous railway signal, track and motive power devices, the inventor of the first all-steel railway passenger coach put into service on the New York subways and the Long Island Railroad, and being instrumental in the

development and perfection of design of steam railway electrification structures and equipment. He has been consulting engineer for the Rapid Transit Subway Construction Co., a member of the board of engineers of the New York terminal, Pennsylvania Railroad, which board was in charge of designs involved in the construction of the tunnels under the Hudson and East rivers and across Manhattan Island. He was in charge of the design and construction of various changes and additions in the Pennsylvania station, New York, to provide for enlarged and additional passenger facilities and mail-handling equipment. He is now engaged in electrification work being carried out by the Pennsylvania Railroad for electrification of its main lines from New York to Washington. He has also acted as consulting engineer for many other railways and public utility companies. In 1912 he was the recipient of the Norman medal.

National Conference to Study Construction Problems

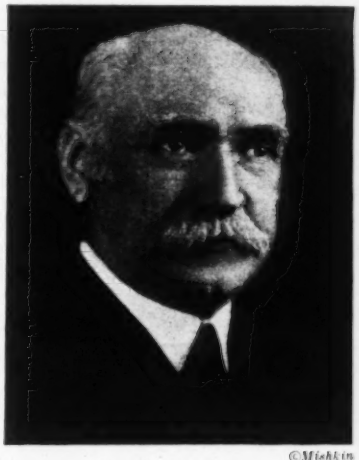
A tentative program was outlined and special committees were authorized to study and report on progress of the construction industry at the initial session of the executive committee of the National Conference on Construction, held in Washington on Jan. 15. The purposes of the conference, as defined by the executive committee, are: "To review the outstanding common problems of business and other interests identified with public and private construction; to select a limited number of problems of the above type as will lend themselves step by step to constructive intergroup action; to develop the necessary factual studies of such problems, and to agree upon recommendations to be made to the cooperating agencies, public and private, looking toward the solution of such problems."

Secretary of Commerce Lamont and Julius H. Barnes, general chairman and chairman of the executive committee, respectively, were authorized to appoint five special committees to study and report back to the executive committee on business reports for the construction industries, including methods for improving the statistical and trade information in this field; on elimination of wastes and undesirable practices in the construction field; on improved financing of income properties, with particular attention to appraisals and inspection; on local organizations in the construction business, and on the present organization of the building and construction business and economic forces involved.

Mr. Lamont and Mr. Barnes were authorized to provide for representation in the conference of all the various trade groups in the construction field and also to add to the membership of the executive committee in their discretion. F. Stuart Fitzpatrick, manager of the civic development department of the U. S. Chamber of Commerce, was appointed secretary of the conference. Chairman Barnes was authorized to name a special committee to secure funds necessary for carrying on the work of the conference.

Francis Lee Stuart Elected President of Civil Engineers

Francis Lee Stuart, consulting engineer, New York, former chief engineer of the Erie and of the Baltimore & Ohio railroads, was elected president of the American Society of Civil Engineers at the annual meeting on Jan. 21.



©Mishkin

Francis Lee Stuart

Primarily, Mr. Stuart is a railroad man, having begun his railroad career as a rodman on the Baltimore & Ohio when eighteen years of age, but in more recent years his time has been devoted to the larger field of general transportation as a consultant on terminal matters.

Mr. Stuart's early experience was largely on construction of railway lines in the Southeastern states. In 1897 he left railway work for a time to take up work first with the Nicaragua Canal Commission and subsequently with the Isthmian Canal Commission, but in 1899 he returned to the B. & O. to become an assistant engineer on construction and ultimately engineer of surveys of the entire system. This position he resigned in 1905 to become chief engineer of the Erie Railroad. Five years later, in 1910, he returned to the B. & O. as chief engineer, which position he resigned in 1915 to engage in private practice.

During the war Mr. Stuart was chairman of the terminal port facilities committee of the War Industries Board and later chairman of the budget committee of the U. S. Railroad Administration. Since 1920 he has served on numerous boards and commissions, including the board of review, Chicago Sanitary District; and the Giant Power Advisory Board, State of Pennsylvania.

Mr. Stuart has served the society as both a director and a vice-president. He is a past-president of the Society of Terminal Engineers.

Corpus Christi Dam Failure

(Continued from page 163)

to excessive percolation of water through the underlying lenticular bed of silt, sand, gravel and clay on which the entire structure rests.

Percolation for Months

"Borings taken at the site since the failure clearly indicate that the steel sheetpiling constituting the upstream cutoff wall did not penetrate an impervious bed of clay, and therefore seepage could take place between the bottom of the sheetpiling and the clay bed.

"In our opinion this percolation had been proceeding for months before the final failure occurred, the passage of water being sufficient to carry off the finer material until finally such a stream of water was passing under the sheetpiling that the drains under the apron were incapable of carrying it off and eventually a sufficient upward water pressure developed to rupture the apron, thus precipitating the failure of the structure.

"Immediately this occurred the resistance to the flow was removed and a rush of water occurred of sufficient volume to undermine completely the north abutment, which moved out from the end of the spillway section and dropped vertically, followed by rapid erosion of the adjacent earth embankment, eventually allowing all the water in Lake Lovenskiold to escape.

No Evidence of Earthquake

"The designing engineers have suggested the possibility of an earthquake shock having contributed to the failure. This, of course, is possible, but we find no evidence on the ground to substantiate this theory.

"The borings (or foundation explorations) which are being undertaken have not progressed sufficiently to justify a statement from us at this time regarding the character and extent of the remedial measures which should be taken to restore the dam nor is it possible for us to make even an approximate estimate of the cost of same. This is due to the impossibility of investigating the condition of the spillway apron, which is covered with many thousands of tons of sand and débris which must be removed before satisfactory examination can be made. Enough of this apron has been uncovered, however, to show that an "explosion" or upheaval has taken place and that the apron at the north end and near its center is about 3 ft. higher than it was when it was poured in place and is so completely ruptured as to necessitate its removal and replacement.

"In addition, it will probably be necessary to construct a blanket and puddle wall of impervious material for several hundred feet above the upstream face of the entire dam, and an effort is being made to locate material in the immediate vicinity of the dam which will be suitable for this purpose.

A.E.C. Considers Legislation

(Continued from page 163)

shall be used, whether for domestic water supply, navigation, flood control, irrigation or power. This proposal was referred to the water resources committee.

The Assembly opposed plans advocated by various organizations and individuals looking to the issuance by the federal government of large amounts of bonds for emergency construction work. Council took the position that the government departments are not organized to spend efficiently within a short period any large sums in addition to appropriations already made, and that the money already made available by the federal, state and municipal governments and by industry is so large in the aggregate as to make the effect of an additional billion dollars which might be appropriated of minor importance.

Federal Public Works Department Favored

Gardner S. Williams, chairman of the committee on government reorganization, reported that the time was ripe to revive agitation for a federal department of public works and that the committee hopes to have something definite to present in a very short time.

Acting upon the recommendation of the Washington Society of Engineers, the Assembly voted to indorse in principle the proposal that the federal government pay all necessary expenses of transporting civilian engineer employees, their dependents and effects incurred in changing stations.

The Assembly voted that Council should use its influence to obtain the appropriations necessary to restoring the locks in the Norfolk-Florida canal. The Council's previous position with regard to Muscle Shoals was affirmed—namely, to oppose all bills which contemplate government ownership or operation or set aside the intent and purpose of the federal water-power act.

The Assembly voted to support the Treadway bill for amending the federal-aid act by changing the limits of payment per mile so as to bring the co-operative percentage, now about 36 in most states, up closer to the theoretical 50-50 basis.

Two bills sponsored by the President's emergency committee for employment to remove conditions which hinder rapid execution of federal building projects were indorsed by Council.

Road and Bridge Construction

Council voted to oppose the Black-McDuffie bill pending in Congress providing that the federal government should cooperate in road and bridge construction on a 50-50 basis with municipalities having a population in excess of 30,000. Although nearly all funds for road construction are raised from gasoline taxes largely paid for by people who live in cities, the Assembly took the position that the cities should carry the responsibility of financing their own street and bridge construction. The Assembly also voted to oppose the Brookhart bill to authorize increased appropriations for federal-aid highway construction in 1932 and 1933, on the ground that the situation with respect to federal-aid funds does not warrant the appropriation of additional amounts that would require either a large bond issue or a great increase in taxes. Senator McKellar's bill, providing for post-road construction in counties as described by Council, as a very bad measure, as under its provisions the appropriations would amount to practically an outright gift to counties and municipalities.

The Assembly voted to take no action on Senator Capper's bill to create a commission to regulate gas pipe l[ines], but reiterated its opposition to cre[ation] of additional commissions unless [the] necessity for them is clearly establish[ed].

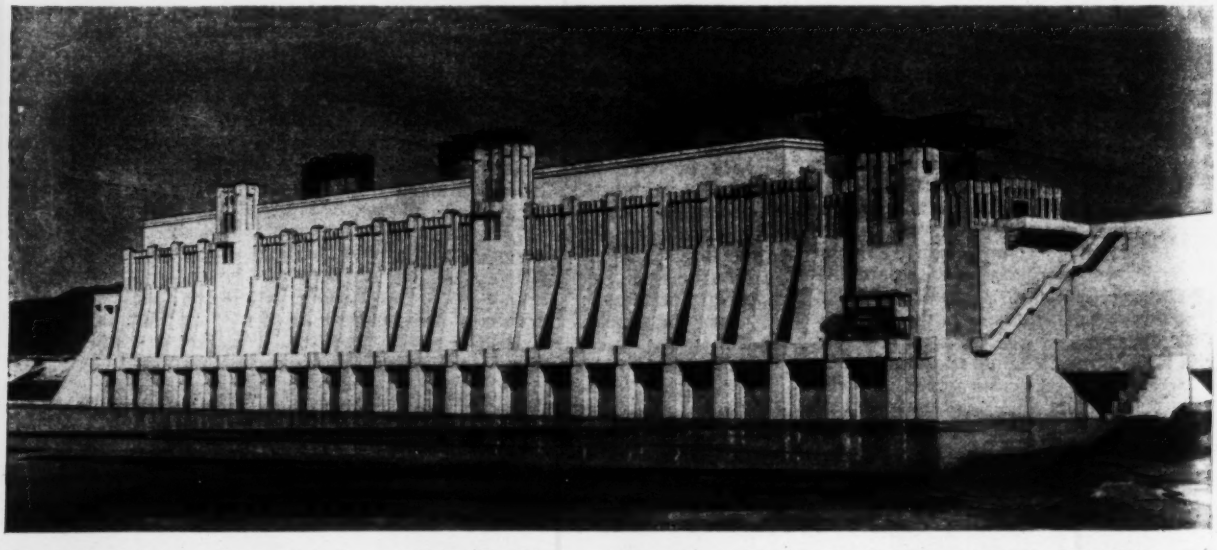
Council was assured of the supp[ort] of the Army Engineer Corps in an address by Major Gen. Lytle Br[own], who shared honors with George [O.] Smith, chairman of the new Fed[eral] Power Commission, at the dinner on Jan. 16.

"I wish American Engineering Co[un]cil godspeed," said General Brown. "I take its mission to be the promotion of public interest, so far as the engineers of the country banded together can promote that interest. To promote the public interest, any agency devoted to that must be free from private interest, free from entangling alliances, free from rancor. It must be no hair splitter, but just and right in the largest sense. With those things in view, I assure the Council the whole-hearted support of the Corps of Engineers, which is devoted solely to public service."

The Assembly acted favorably upon the application for membership of the Colorado Engineering Council, Denver, and welcomed its representative, R. C. Gowdy, chief engineer of the Colorado & Southern Ry.

New members elected to the administrative board for 1931 include: R. W. Trullinger, of Washington, D. C., American Society of Agricultural Engineers; E. K. Ruth, Engineers Club of Cincinnati; P. L. Brockway, of Wichita, Kansas Engineering Society; George R. Armstrong, of the Engineers and Architects Club of Louisville, Ky.; A. A. Potter, dean of Purdue University, Lafayette, Ind., and Prof. Joseph W. Roe, New York University, American Society of Mechanical Engineers; and Joseph Lamprecht, of Utica, Mohawk Valley Engineers Club.

ROCK ISLAND POWER STATION IN WASHINGTON



The 880-ft. hydro-electric power station at Rock Island as it will appear when completed. The above picture is from an architect's drawing of the big plant on the Columbia River near Wenatchee, Wash., which will house generators for an ultimate production of 240,000 hp. of electric energy. It is now under construction for the Puget Sound Power & Light Co., and the first four units will be in service by August, 1932. The cost of the project when fully developed will be $28,000,000.

Civil Engineers Set Up Division to Study Economics

A NEW division to take up the economics of civil engineering work was authorized by the board of direction of the American Society of Civil Engineers at its meeting held in New York Jan. 19-20 in advance of the annual meeting of the society. It is expected that the division will get organized before the close of the meeting. The setting up of two new local sections, one in Panama and one in Alabama, and the establishment of student chapters at Harvard University and at the Michigan College of Mining and Technology also were authorized.

Publicity and Educational Work

A plan for a campaign of publicity for civil engineering work, as proposed by the committee on education of the public, was adopted by the board of direction and a small appropriation for expenses was included in the budget. The committee has laid down an outline of radio talks and talks before nontechnical groups, also newspaper articles for general distribution.

New rules for accredited schools were adopted, including one providing that the society will not recognize an engineering school until after the board of direction has received a favorable report upon its scholastic work from a committee appointed to visit the school and study its operations. Newark College of Engineering was recognized as an accredited school.

Registration of Engineers

Recommendation by the society's committee on registration of engineers that the subject of revision of the model law be taken up with the joint committee on uniform registration laws was approved. The committee wants to propose establishing more appropriate educational qualifications.

The report of the joint architect-engineer committee upon adjustment of the differences which now exist between the two professions was not acted upon finally because of lack of time to study it in detail. It was, however, referred back to the committee for consideration of some points. (The report is published on p. 159 of this issue.)

Legislative Studies

A full study of the water resources of the country, similar to that recommended by Engineering Council at its meeting last week, was recommended by the society's committee on legislation and was indorsed by the board of direction. A thorough study of lien laws also was indorsed. Indorsement was given to a proposal to make a thorough study of the operations of the U. S. Weather Bureau with a view to increasing the usefulness of Weather Bureau data to the engineering profession.

Bylaws were adopted by the board of direction putting into effect the society's functional program, approved last year. Other bylaws set up certain safeguards about the admission of junior members, particularly those from foreign countries, and make provision for examination of candidates for admission who are not college graduates.

Final action was taken by the board upon the redistricting of the country, new district boundaries were approved, and Roy C. Goudy, of Denver, was received as director for the new district, district 16.

Changes were made in the rules governing the award of the Phebe Hobson Fowler architectural awards to provide for an award for each of three types of structures rather than three grades of awards.

May Extend Baltimore's Water-Supply System

An additional loan of $35,000,000 to extend Baltimore's water-supply system is to be recommended to the Maryland general assembly, which convenes this month. This decision was reached by the water committee of the Public Improvement Commission, Baltimore. The general assembly will be asked to pass an enabling act and the voters of Baltimore will be called upon to ratify the loan in May.

Contracting Firm Expands

Inauguration of an enlarged construction service prepared to handle projects of any magnitude in all parts of the Western Hemisphere was announced on Jan. 15 by the Merritt-Chapman & Scott Corp., New York City. This extension is accomplished through the formation of two new subsidiaries: the Merritt-Chapman & Williams Corp., affiliated with the W. Horace Williams Co., Inc., of New Orleans, La.; and the Merritt-Chapman & Whitney Corp., affiliated with the Whitney Brothers Co., of Duluth, Minn., and Detroit, Mich. William H. Baker, president of the parent company, is chairman of the board of both subsidiaries. These will be operated, however, as self-contained units under the direction, respectively, of W. Horace Williams and Gwin A. Whitney, presidents.

The W. Horace Williams Co. and its predecessor companies have done much wharf, terminal and foundation construction and general engineering-contracting work in the South, in Central and South America, and in Mexico. The Whitney Brothers Co., since its establishment in 1889, has carried out many heavy construction contracts in different parts of this country, although its particular field is the Great Lakes and the Northwestern states. The expanded organization, including other subsidiaries, now controls net assets in excess of $11,000,000, plant and equipment valued at over $7,000,000, and employees to the number of more than 5,000.

Engineering Council Outlines Toll Bridge Legislation Needs

IN ITS second report in recent months the committee on bridge legislation of American Engineering Council presented a set of recommendations pertaining to future toll bridge legislation which, following adoption of the report by the recent assembly in Washington, may be regarded as Council's attitude on this important subject. In general the report criticises present methods of franchise granting by Congress and asks for reform and simplification; it favors free bridges, public toll bridges and private toll bridges in the order named, stressing the importance of encouraging private capital to invest in toll bridges; it emphasizes the necessity for fixing bridge clearance heights on the principal waterways; and it points out that legislation should be applicable to tunnels and bridges alike. The principal recommendation of the first report, which was reaffirmed in this second report, was to oppose the Dennison bill and similar bills pending in Congress.

The Council's Attitude

The following represent Council's attitude on the requirements of future toll bridge legislation:

1. Present methods of granting franchises by action of Congress in each case are objectionable. Franchises should be given by some department of the government in accordance with general legal stipulations laid down by Congress.

2. New legislation should represent a simplification of present procedure.

3. The federal government's franchise-granting authority should not extend to bridges over intrastate streams or to bridges that are not now subject to federal jurisdiction.

4. New legislation should contain the essential features of the bridge laws of 1899 and 1906 and the practice as embodied in the standard forms for bridge bills recently used by Congress.

5. Bridge plans and specifications should be furnished, as soon as they are available, to the Bureau of Public Roads and the interested state highway commissions for their information.

Should Encourage Private Capital

6. Private capital should be encouraged to construct toll bridges, but privately owned toll bridges should be permitted only where local authorities are not ready and able to construct a public toll bridge. Further, a public toll bridge should not be built if the local authorities are ready and able to build a free bridge.

7. Costs of bridges should be filed with the secretary of war and Chief of Engineers within 90 days after completion.

8. In granting a bridge franchise, careful consideration should be given to the probable effect on existing bridges and to the protection of the public as

well as to the property rights of the investors in the bridge.

9. All franchises granted should provide clauses permitting: (*a*) condemnation and purchase of the bridge at any time by such legal processes as are established in the state or states in which the bridge is located; (*b*) recapture of the bridge by local authorities not sooner than twenty years after its completion at a price to be made up of the actual cost of construction less reasonable depreciation plus the actual cost of acquiring the real property plus actual expenditures for necessary improvements.

Standard Clearance Requirements

10. For use in preliminary consideration of bridges, standards of clearance requirements over the principal waterways of the United States should be fixed.

11. In considering applications for bridge permits, due weight should be given to the interests of transportation over as well as to navigation under or through the bridge.

12. Where an existing franchise provides legal procedure for condemnation of a toll bridge, such procedure should be exhausted before the construction of a competing publicly owned bridge is permitted.

13. No legislation should be enacted that embodies features which are retroactive, confiscatory or adverse to the stipulations of existing franchises.

14. All bridge legislation should be equally applicable to tunnels.

The members of the bridge committee of American Engineering Council are H. S. Crocker, chairman; A. H. Fuller, F. M. Gunby, A. J. Hammond, John Lyle Harrington and D. B. Steinman.

Government Budgets Half Billion Dollars for 1931 Construction

This week's estimate of total public works construction in 1929-31 includes federal government figures totaling 342 millions for the fiscal year 1929-30, 285 millions for 1930-31, and 497 millions for 1931-32. The expenditures as reported are classified below.

In Thousands of Dollars

	Fiscal Year		
	1929–30	1930–31	1931–32
Emergency construction fund	.....	.....	*$150,000
Federal-aid roads	86,000	$96,356	144,726
Treas. dept. bldgs.	24,546	75,625	80,000
Vet.'s bureau Constr.	.....	4,500	11,500
War dept. bldgs.	40,000	35,000	.....
Navy dept. bureau yards and docks	17,437	25,000	.....
Navy dept. construction and repairs	58,000	.....	.....
Interior department	16,111	39,802	27,500
Dist. of Col. comrs.	7,632	8,785	2,430
River & harbor impv.	92,644	.....	77,818
	$342,370	$285,068	$496,974

These figures and the regular returns on state, county and municipal programs show this year 7 per cent ahead of last in expected volume and 12 per cent ahead of 1929. Following are this week's totals:

1929	$3,374,000,000
1930	3,535,000,000
1931	3,798,000,000

Washington Notes

By PAUL WOOTON
Washington Correspondent

Federal Power Commission Begins to Function—House Amends Bill to Speed Up Public Construction

APPARENTLY the new Federal Power Commission is firmly seated in office. The comptroller general, who is appointed for a term of seventeen years and who is independent of both the legislative and executive branches of the government, did not hold up the pay checks of the new commissioners, as had been expected in certain quarters. It also has been predicted that Congress will withhold appropriations for the salaries of the commissioners, inasmuch as the Senate contends that the vote on their confirmation has been reconsidered, but the independent offices appropriation bill, reported to the House on Jan. 21, included provision for the salaries of $10,000 each for the commissioners. To meet the expenses of the commission during the next fiscal year, $260,195 was provided in the bill. The report of the appropriations committee states that the 1932 estimates are framed on the assumption that the engineering services of the departments of war, interior and agriculture will continue to perform the field work of the commission during the year.

By unanimous vote of the commission, William V. King, chief accountant of the old commission, has been restored to the staff, but it is pointed out that immediate responsibility for accounting policies will be vested in Commissioners McNinch and Draper. Engineering employees will be under the direction of Commissioner Garsaud. Employees handling questions involving lands, water rights and general legal matters will report to Commissioner Williamson.

F. E. Bonner, executive secretary of the former commission, who is a civil engineer, has undertaken the practice of his profession. Among other things he will serve the Bureau of Reclamation in a consulting capacity. Col. Max Tyler, chief engineer of the old commission, has been requested to continue in that office until the new commissioners have familiarized themselves with the details of pending cases.

Expediting Public Building

Legislation designed to expedite the public building program by granting broader powers to the office of the supervising architect of the treasury was accepted by the House on Jan. 19 after certain provisions of the bill had been modified. The bill permits the treasury department to suspend competitive bidding in contracting for surveys for sites, to limit the time for advertising for bids and to obtain outside architectural, engineering, and technical services. As submitted to the House, the bill would have enabled the secretary of the treasury to restrict bidding on construction to such persons, firms or corporations as possess the qualifications deemed necessary to the efficient execution of the work. This provision was withdrawn on objection that it concentrates too much power in an executive department.

The Senate judiciary committee has reported favorably the bill already passed by the House which will permit the government to take possession of building sites in advance of final judgment in condemnation proceedings.

A.R.B.A. Elects Officers

The vote for officers announced by the American Road Builders Association at the annual convention in St. Louis, Mo., Jan. 12-15 resulted in the election as president of William R. Smith, president, Lane Construction Corp., Meriden, Conn. Otto Hesse, Grand Rapids, Mich., was named president of the county highway officials division, George B. Sowers, Cleveland, president of the city officials division, and W. T. Chevalier, publishing director, *Engineering News-Record*, New York, president of the manufacturers division.

Samuel Eckels, chief engineer, Pennsylvania department of highways, was elected vice-president, Northeastern district; H. G. Shirley, Richmond, Va., vice-president, Southern district; S. F. Beatty, Chicago, Central district; Samuel Hill, Washington State Good Roads Association, honorary life president.

James H. MacDonald, New Haven, Conn., was elected treasurer. The board members elected are: Robert B. Brooks, director of streets and sewers, St. Louis; H. K. Bishop, Washington, D. C.; Paul L. Griffiths, vice-president, American Tar Products Co.; A. Lee Grover, secretary, New Jersey state highway department; Richard Hopkins, Troy, N. Y.; J. E. Pennybacker, New York; H. C. Whitehurst, Washington, D. C.

Would Create Bridge Authority for New York Toll Structures

A bill, the purpose of which is to provide a bridge authority to have under its supervision and control all major highway toll bridges of the state, has been introduced into the New York general assembly. The bill creates a temporary commission of six members to consist of two members of the Senate, two members of the Assembly and two persons to be named by the governor to survey and study the maintenance, operation and financing of certain highway bridges spanning the Hudson, Niagara and St. Lawrence rivers; to investigate the advisability of recapture by the state of the Bear Mountain bridge across the Hudson River this year, and a method of financing these bridges. The commission must report to the legislature before March 1. An appropriation of $5,000 is provided.

Railway Engineers' Meeting Cut to Two Days

On account of present unsatisfactory business and economic conditions the program of the annual meeting of the American Railway Engineering Association has been changed from the usual three days to two days, a business session being held on the evening of the first day and the usual annual dinner being omitted. It is expected that all the reports can be presented and discussed, especially as many of the reports this year are unusually brief. This meeting will be held in Chicago on March 10 and 11.

Personal Notes

GEORGE A. LOHRER, Seattle, Wash., for nineteen years construction superintendent for the W. T. Butler Construction Co. in Seattle, has withdrawn from that firm and is now engaged in general contracting business with offices in Seattle.

CHARLES A. MAGRATH, who has been chairman of the Ontario Hydro Electric Power Commission since the death of Sir Adam Beck more than five years ago, has announced his resignation, to take effect immediately. Mr. Magrath is chairman of the International Joint Commission and will devote all his time to the commission's problems.

JOHN GIDIERE has been appointed city engineer of Gretna, La. Mr. Gidiere has been acting city engineer since the resignation of William H. Vincent on Aug. 26 last.

L. V. HITES, contractor and engineer, has incorporated the Sandy Hites Co., with himself as president and manager, and has discontinued temporary offices at Des Moines, Iowa, Paris, Ark., and Warsaw, Mo., and established permanent offices in Kansas City, Mo.

Obituary

HARRY HAWGOOD, formerly chief engineer of the San Pedro, Los Angeles & Salt Lake R.R. and subsequently engaged in private practice as a consulting civil engineer, died in Los Angeles on Jan. 3. Mr. Hawgood was born in 1853 in Derbyshire, England. His first engineering work was in South Africa in 1874 in the engineering department of the colonial government railways. He came to the United States in 1880 and participated in the construction of some of the transcontinental railroads. He became chief engineer of the San Pedro, Los Angeles & Salt Lake R.R. in 1909. He was a member of the board of flood control of Los Angeles County and was a former director of the American Society of Civil Engineers. He also was a past-president of the Los Angeles section of that organizaton.

ALAN R. MCFARLAND, a member of the engineering staff of the Solvay Process Co. and president of the Onondaga Brick & Tile Co., died at his home in Syracuse, N. Y., on Jan. 13. Mr. McFarland, who was 60 years old, was a graduate of Cornell University.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York City; annual meeting, New York, Jan. 21-23.

AMERICAN WOOD PRESERVERS' ASSOCIATION, Washington; annual convention, Philadelphia, Pa., Jan. 27-29.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, Washington; annual meeting, San Francisco, Jan. 26-28.

ENGINEERING INSTITUTE OF CANADA; annual meeting, Montreal, Feb. 4-6.

NATIONAL PAVING BRICK ASSOCIATION, Washington; annual meeting, Pittsburgh, Pa., Feb. 4-6.

NATIONAL READY MIXED CONCRETE ASSOCIATION, first annual convention and exhibit, St. Louis, Mo., Jan. 26.

NATIONAL SAND AND GRAVEL ASSOCIATION, Washington; annual convention, St. Louis, Mo., Jan. 27-29.

BALTIMORE ENGINEERS CLUB at a luncheon on Jan. 14 enjoyed a motion picture, presented by the Baltimore *Sun*, showing the making of a newspaper from the time trees are felled and taken to the paper mill to the time the paper is delivered in the home.

ENGINEERING COUNCIL OF UTAH has elected officers as follows: president, H. C. Goodrich, Salt Lake City, chief engineer, Utah Copper Co.; vice-president, Clifford P. Evans, Salt Lake City, architect; secretary-treasurer, George M. Bacon, state engineer of Utah.

ENGINEERS CLUB of Wichita, Kan., at its annual election on Jan. 9 elected officers as follows: president, George H. Miller; vice-president, J. I. Michaels; secretary-treasurer, E. C. Merydith.

INTERMOUNTAIN BRANCH, Associated General Contractors of America, held its annual meeting Jan. 12 at Salt Lake City. The following officers were elected: president, A. E. Christensen; vice-president, J. B. Mullins; secretary-treasurer, Thomas Sorensen. Governor Dern was one of the speakers at the banquet.

MINNESOTA FEDERATION OF ARCHITECTURAL AND ENGINEERING SOCIETIES will hold its tenth annual convention in Minneapolis Feb. 27 and 28. There will be a discussion of recent developments in concrete highway construction and a paper entitled "Brick Engineering and Its Relation to the Construction Industry," by Hugo Filippl, Common Brick Manufacturers Association, Chicago.

MOHAWK VALLEY ENGINEERS CLUB at its meeting in Utica, N. Y., on Jan. 14 listened to a talk on "Railroad Structures" by W. J. Jordan, executive engineer of the New York Central Railroad, who was engineer in charge of the building of the new Buffalo railway terminal and who is also in charge of the grade-elimination work at Syracuse.

NATIONAL CONFERENCE ON CITY PLANNING will hold its 21st meeting in Rochester, N. Y., in May. Rochester was the first meeting place of the conference. The program has not yet been announced.

NATIONAL READY MIXED CONCRETE ASSOCIATION will hold its annual convention at St. Louis on Jan. 26. Speakers announced in the preliminary program include the following: A. T. Goldbeck, bureau of engineering, National Crushed Stone Association, "Design of Concrete for Strength, Permeability and Workability"; J. L. Shiely, St. Paul, Minn., "Suggested Strength Specifications"; Henry D. Johnson, Jr., bureau of bridges, Pittsburgh, Pa., "Premixed Concrete From the User's Viewpoint"; Stanton Walker, National Sand and Gravel Association, "Yield of Aggregates in the Design of Concrete." Addresses will also be made on the use of ready-mixed concrete in their respective cities by J. C. Eakin, Little Rock, Ark.; R. B. Young, Toronto, Canada, and Alexander Foster, Jr., Philadelphia.

NEW JERSEY SEWAGE WORKS ASSOCIATION will hold its sixteenth annual meeting in Trenton on March 20 and 21.

NORTHWEST CONCRETE PRODUCTS ASSOCIATION held its sixth annual convention in Olympia, Wash., on Jan. 9. Among the speakers were: C. W. Kief, Portland Cement Association, "Selling Concrete Masonry Units"; T. C. McCrory, Washington state highway department, "An Engineer's Viewpoint"; E. M. Ambler, Superior Portland Cement Co. "Hyurly and Portland Cement"; C. M. Howard, Concrete Pipe Manufacturers Association, "Cooperative Effort"; H. H. Botten, Washington Fund Surveying Bureau, "Insurance"; Bailey Tremper, Washington State College, "Concrete Culvert Pipe Investigation"; H. W. Nightingale, sanitary engineer, state health department, "Sewage Disposal in Urban and Rural Districts." Officers elected were: president, Carl Warren, Spokane, Wash. (reelected); vice-presidents, Clyde Grutze, Portland, Ore., E. L. Warner, Tacoma, Wash., and Earl Bracken, Aberdeen, Wash.; secretary-treasurer, Fred Strange, Port Angeles, Wash.

PACIFIC NORTHWEST BRANCH, Associated General Contractors of America, held its annual convention in Seattle, Wash., on Jan. 9-10. The following officers were elected: president, Otto J. Amberg, Spokane, Wash. (reelected); treasurer, J. A. Lyon, Spokane, Wash.; secretary, J. M. Clifton, Spokane. The branch went on record as in favor of prequalification of bidders on public works and urged the enactment of prequalification laws in the states under its jurisdiction. Announcement was made of the formation of the Mountain Pacific chapter, with headquarters in Seattle.

SEVENTEENTH ANNUAL ROAD SCHOOL is being held Jan. 19 to 23 at Purdue University, Lafayette, Ind., under the direction of the engineering extension department and school of civil engineering of the university, in cooperation with the Indiana state highway commission, the Indiana County Highway Superintendents Association, the Indiana County Surveyors and County Engineers Association and the Highway Materials and Equipment Association. Papers by prominent highway engineers and discussions make a full program.

SOUTH CAROLINA SOCIETY OF ENGINEERS at its annual convention in Columbia elected the following officers: president, Thomas F. Ball, member of the faculty of the University of South Carolina; vice-president, J. E. Gibson, of Charleston; secretary-treasurer, F. C. Hensley. The summer convention will be held in Spartanburg in June or July.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost			Volume		
Jan. 1, 1931	**194.48**		**December, 1930**	**192**
Dec. 1, 1930	196.86		November, 1930	207
Jan. 1, 1930	208.96		December, 1929	166
Average, 1930	202.85		Average, 1930	240
Average, 1929	207.02		Average, 1929	317
1913	100.00		1913	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Jan. 22, with some comparisons, total as follows:

(In Thousands of Dollars)

	Jan. 22 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$ 2,305	$ 3,216	$ 7,789
Other	18,268	16,298	18,985
Streets and roads..	12,044	7,049	6,228
Other eng. constr...	7,891	23,611	14,176
Total	$40,508	$50,175	$47,180
Total, all classes Jan. 1 to 22:			
1931			$200,703
1930			188,720

Equipment and Materials at the 1931 Road Show

Power-grading equipment most prominent at St. Louis exposition—Elevating graders show signs of revival—Wide variety of dump-truck bodies on display

Engineering News-Record Staff Report

A TOTAL of 298 manufacturers and producers of highway equipment, accessories, tools and materials exhibited at the 1931 Road Show, known officially as the 28th Annual Exposition of the American Road Builders Association, held in the new arena at St. Louis Jan. 12-16. A number of the crane, shovel, and concrete-mixer manufacturers, by agreement among themselves, did not exhibit this year. The absence of their large equipment gave an unusual appearance to the show but did not lessen interest. Many small equipment manufacturers expressed the opinion that their equipment received more attention than at any previous showing.

Advances in Design

Probably the greatest advance in equipment design was in the power-grader and highway-building machine field, including elevating graders. The elevating grader seems to be coming back, evidently due to the success of the crawler-type dump wagon and the adoption of separate power units on the graders, which makes this type of excavating machine most efficient. Many other types of graders were self-propelling and power-handled. Another trend, noted last year, is the continuing increase in use of frictionless bearings and alloy steels. A greater variety of trucks and dump-truck bodies was shown than ever before.

Several pieces of equipment were shown with rubber crawler tracks over traction wheels.

Models demonstrating processes or machinery were used by 26 exhibitors. Walter W. Foster of Wichita Falls, Tex., showed a model of a patented 8-ft. subgrade and earth tamper, which he expects to have on the market soon. The tamper bar will weigh 5,000 lb., and the machine will be useful in tamping earth-dam fills as well as highway subgrades.

A new method of description of products was introduced by three exhibitors. This was the use of talking pictures. Caterpillar Tractor Co., Austin-Western and Dodge Motor Truck Co. used this innovation in connection with their exhibits.

Highway Department Displays

Interesting and educational showings were made by various highway departments, led by the U. S. Bureau of Public Roads. The bureau's extensive exhibit included models showing the construction of every type of road and many bridges; the results of soil tests; suggested highway designs for various soils; subgrade surveys and numerous photographs of bridges and highways. Missouri's highway department exhibit included a huge map of the state showing the early and modern routes and the larger cities. A selection of colored photographs of many beauty spots of the state were shown. The state highway departments of California, New Jersey, South Carolina and Tennessee also had educational and photographic exhibits. An aducational exhibit cover ing machinery markets, exports an other equipment data was shown b the U. S. Department of Commerce.

The following report attempts t cover briefly all the equipment and mate rials exhibited at the show, with new models and improvements noted where possible.

Grading Equipment

Power Shovels, Excavators, Cranes and Buckets—No shovels larger than ½ cu.yd. were shown. The Trackson Co. displayed the Trackson ½-yd. high shovel on crawlers with a McCormick-Deering power unit. The Byers Excavator Co. showed two improved models of their standard ⅜-yd. shovel, both Hercules powered. The model 40, mounted on crawler treads, contained the new trailer design consisting of two separate axles with solid-rubber-tired wheels that can be readily placed in position to carry the shovel for long and fast moves. The Byers model 50 shovel was mounted on four wheels having solid-rubber tires. Crane booms and back hoe attachments were also shown by Byers. A ⅜-yd. shovel, called a traction ditcher, was shown by the Buckeye Traction Ditcher Co. Mounted on crawlers, the machine is powered by a Waukesha unit installed inside an inclosed cab. Ohio Locomotive Crane Co. introduced a ⅜-yd. shovel mounted on crawlers, the machine is powered by Cormick-Deering, that was equipped

Highway equipment exhibited in main arena, St. Louis Road Show

This view shows only a small number of the exhibits. Most of them were in two buildings on each side of the main arena. The roofs of these two side buildings were too low to permit a panoramic picture to be taken of the machinery on display.

with hydraulic steering and brake devices, with starter and generator available. A chain bucket-elevator type of excavator was shown by Geo. Haiss Mfg. Co., mounted on improved longer crawlers and powered by a 60-hp. Waukesha unit. A new feature of this machine is a positive bucket clean-out.

Michigan Power Shovel Co. exhibited two ⅜-yd. swing-boom shovels on crawlers, one an Allis-Chalmers unit and one a McCormick-Deering power unit. A ⅜-yd. dragline on crawler treads was also displayed.

Tractor Cranes

No truck cranes were shown, but several handy cranes mounted on tractor units were displayed. Nelson Iron Works had a 3,000-lb. capacity tractor crane on a McCormick-Deering unit with four solid-rubber-tired wheels. Two 2-ton Roustabout cranes were shown by Hughes-Keenan Co., one on a McCormick-Deering four-wheeled tractor and the other on an Allis Chalmers model U tractor with Trackson crawler wheels. Frederick H. Poor, Inc., displayed two Loadmaster cranes of 3,500-lb. capacity on McComick-Deering Tractors, one with four rubber-tired wheels and one with Trackson crawlers.

There were no great changes shown in the bucket line. Hayward Co. had on hand a model of their new class K digging bucket with the bowl of one-piece steel construction and with tubular corner arms. Hayward also showed models of orange-peel, dragline and rehandling buckets. A ¾-yd. Favorite, a 1½-yd. cleanup and a double-arch dragline bucket were displayed by G. H. Williams Co. Owen Bucket Co. had on hand their standard ¾-yd. digger type M and a 1-yd. type S rehandling bucket. Blaw-Knox showed two of their Dreadnaught line of buckets, a ¾-yd. digger with improved alloy teeth and a rehandling bucket of the same size, as well as a dragline bucket. Geo. Haiss Mfg. Co. showed an improved ½-yd. Hi-Power clamshell bucket with roller-bearing sheaves, new design teeth and larger jaws.

Grading, Scraper and Maintenance Machines—Power graders and scrapers were prominent. A sensation in pulled scrapers was shown by Davenport Locomotive and Mfg. Co. in the LeTourneau 7-yd. all-welded scraper, mounted on four wide-tread steel wheels, pulled by a Caterpillar 60 and dumped by cables operated by a hoist on the rear of the tractor. This rig has been used in the Far West for some time, but this is the first time it has even been exhibited at a road show. Davenport-LeTourneau also showed a pulled grade rooter riding on two wide-tread steel wheels and an unmounted bulldozer equipped with cables for handling through a hoist. Blaw-Knox displayed a new 7-yd. scraper of a different design, with two 3½-yd. scoops mounted in tandem on crawlers, pulled by a tractor. A Fuller & Johnson gas engine supplies power for dumping the scrapers, which have a movable front apron permitting high loading. A Ball three-wheeled wagon grader of somewhat similar type but with two 2½-yd. buckets in tandem was also shown by Blaw-Knox. Power for handling the scraper buckets is taken off the rear wheels.

W. A. Riddell Co. showed two of its Warco Roadhog power graders. The model E was equipped with a McCormick-Deering power unit, rear crawlers and a bulldozer on front. The 10R rear-control power grader was fitted with rubber track crawlers, pneumatic front wheels, inclosed cab, snow plow and lights for night work. A complete change from rubber to steel crawlers can be made in a few minutes. Riddell also showed a 1-yd. and a 2-yd. wheeled scraper. Baker Mfg. Co. had on hand two Baker-Maney self-loading scraper, roller-bearing equipped, in 1-yd. and 1½-yd. sizes. This firm also showed two hydraulic bulldozers, one on an Allis-Chalmers 35 crawler tractor and one on a Caterpillar 30 tractor; and rollover rotary trailer scrapers.

New Elevating Graders

Five elevating graders were on the floor. Western Wheeled Scraper Co. exhibited a grader of entirely new design. This machine is built around a 12-in. tubular steel backbone, all connections to the main tubular frame being electrically welded. A separate Wisconsin engine drives the elevating belt. The belt travels over a spring-tensioned idler roller that keeps the belt at a constant tension, and the belt rides over the elevator frame in such a manner that it is almost impossible for dirt to get inside the belt. The belt-elevator frame is suspended at three points. Austin-Western Road Machinery Co. showed two elevating graders—the Contractors' Special, with a Buda engine driving the belt, the machine fitted with roller bearings throughout; and the Western Earthmover with a separate Wisconsin engine power unit, full roller-bearing equipped. This last machine is new with the company. J. D. Adams Co. showed its No. 10 elevating grader equipped with a Buda 6-cylinder engine as a power unit. The Hi-Way Machinery Mfg. Co. had literature describing its elevating graders but had no machines on exhibition. Stroud Road Machinery Co. showed models of the Stroud elevating grader and the Little Red dump wagon. Caterpillar Tractor Co. showed an elevating grader with a Caterpillar 60, and with a Caterpillar 20 engine for elevator drive.

A 2-yd. rotary fresno scraper for use with a 60-75 hp. tractor was shown by Western Wheeled Scraper Co. Austin-Western exhibited its 12½-25 dual-drive motor grader equipped with a Buda 6-cylinder engine, pneumatic tires, front scarifier, electric starter and a special blade for oil mixing. It also showed the model 20 dual-drive motor grader with pneumatic scarifier, electric starter, power steering equipment and a wheel sprinkling system, with a McCormick-Deering power unit. This rig is mounted on solid-rubber tires. This company also exhibited its Mammoth Senior leaning wheel grader with front scarifier and back sloper; the Western tandem-drive motor maintainer with front scarifier, fitted with a LeRoi power unit; the model 30 dual-drive motor grader with a McCormick-Deering power unit; and the No. 60 rotating fresno, 7-ft. cut with 2-yd. capacity. J. D. Adams also exhibited a new leaning wheel grader known as model 121 and a model 101 motor grader, with double pneumatic rear tires, powered by a McCormick-Deering unit.

In shoulder finishers Moritz-Bennett Corp. showed an adjustable blade machine mounted on four wheels. The Geo. D. Whitcomb Co. exhibited a new design shoulder-finishing machine mounted on a Sterling Truck. This machine consists of an arm carrying a chain bucket excavator which cuts out the shoulder and carries the excavated material across the truck to another receiving vehicle. The excavator arm is hydraulically operated, and power for the chain buckets is taken direct from the truck engine.

A new 1¼-yd. hydraulic operated rollover scraper was exhibited by LaPlant-Choate Mfg. Co. The hydraulic power for its operation comes from a pump mounted on the tractor. This company also showed a new bull scoop on a Caterpillar 10 to which spreaders can be attached; a rollover scraper with a Caterpillar 30 and a backfiller on a Caterpillar 30. Killefer Mfg. Corp. had seven machines on exhibition, including a new No. 1 road rooter; a new No. 4 road disk or planer for planing asphalt or macadam roads; No. 10-A and No. 8 road rippers; No. 69 and No. 28 revolving scrapers and a No. 25 Mole drainage machine.

Other Grading Equipment

A new type of plow was shown by the Dukelow Hardpan Plow Co. This is a two-toothed plow built of heavy structural-steel beams and plates. A heavy I-beam tongue acts as a full-length shoe when the machine is plowing its maximum depth of 15 in. The teeth, on 24-in. centers, are reversible. Two steel wheels carry the plow when running free or when plowing less than maximum depth, the wheels running ahead free when not in use. A worm gear and cable arrangement lifts the wheels and the plow teeth. Soft rock and the toughest hardpan can be plowed by the rig, according to the maker.

An adjustable subgrader with jack wheel lift and scarifying teeth and a grade rooter were shown by Lakewood Engineering Co. The Pneuo-Hydro Road Machinery Co. exhibited an all pneumatic-operated planer to attach to trucks, promising road maintenance at the rate of 75 to 80 miles of road per day per machine. A new power maintainer for gravel roads, light ditch work, parks and cemeteries was shown by the Burch Corp. The machine is equipped with a 7-ft. blade and a LeRoi power unit mounted on the front of the rig which pulls the machine. The Ryan Mfg. Corp. showed its model 12 lean-

ing wheel grader, regularly equipped with a Novo engine for handling the blade. The blade has an unusual range of positions and can be extended for shoulder work.

A 5½-yd. Highway wheel scraper for tractor haul was shown by the Highway Trailer Co. The scraper is fitted with traveling rakers which fill up the back part of the scoop. Power for operating the rakers and for dumping the scraper is taken from the tractor. The Hug Co. exhibited four of its line of truck-unit Roadbuilders with Buda engines and new equalizer front trucks on all models. The Model 60 was mounted on a truck carrying a single-batch cam-roller gravity dump body. The 85-D was shown with a 3-yd. hoist body, and the model 87-M was mounted with a 4-yd. hoist body. The Hug model 67 maintainer was shown with a new three-way dump body.

Bulldozers and Scrapers

A new hydraulic bulldozer on a caterpillar 60; a new size automatic dump rotary scraper, 45 cu.ft., and a wheel scraper were shown by Euclid Crane & Hoist Co. N. S. Monroe & Sons exhibited their model 31 12-ft. leaning wheel road grader. Wiard Plow Co. had on hand a 5-ft. rotary scraper, a grade ripper and two hand plows. The only full mechanically-operated bulldozer at the show was exhibited by Niess & Company, Inc., mounted on an Allis-Chalmers Monarch 35 tractor with crawler treads. The bulldozer is operated by gears through a power takeoff.

Wehr Co. showed two new power graders and one of its old models. The new model Z-6 heavy power grader, weighing 18,000 lb., was mounted with a Case tractor power unit, rear control. This machine was equipped with double solid-rubber tires in the rear and single solid-rubber tires in front and was fitted with a front scarifier. Another new model, A-4, is a center-control grader on a McCormick-Deering 20 tractor with Wehr crawler equipment. The model U-5 rear-control grader carried a front scarifier and was mounted on an Allis-Chalmers power unit with pneumatic tires, double in the rear and single in front. A new power grader maintainer convertible to a pulled grader was shown by L. C. Wood & Co. Waukesha powered, it is a straight-frame rig with no circle providing 18-in. clearance for the blade.

A new automatic reverse truck grader with a 12-ft. blade mounted on an FWD truck was shown by Willett Mfg. Co. The blade is controlled by a hydraulic cylinder on each end, and the blade is equipped with new design twin-unit double-torsion springs. Shunk Mfg. Co. showed its Success road maintainer and its new Camel automatic tractor gravity dump wagon, 5 to 5½-yd. capacity, mounted on a McCormick-Deering 10-20 tractor and fitted with a bulldozer in front. The Slusser-McLean Scraper Co. exhibited the Wooldridge Road and Trail Builder, a new hydraulic grader, bulldozer and backfiller mounted on a drill rod frame. Twisting of the frame is taken care of by trunnion bearings.

Several grading machines were exhibited by the Caterpillar Tractor Co. A Caterpillar 15 motor patrol with screw lift and model 15 trailer patrol with power lift were shown. A one-man Caterpillar 20 planer with multiple blades and with the front blade set at an angle of 30 deg. for shearing action was displayed. New model leaning wheel graders, a No. 30 and a No. 60 large size, were shown, the No. 30 having a high-lift blade. The Caterpillar Super Special grader and the No. 10 grader were also on the floor. Rome Mfg. Co. showed a new multi-wheel motor grader with a McCormick-Deering power unit, fitted with a scarifier on front. Rome also showed two pulled graders on rubber-tired wheels, models 8 and 12.

Galion Iron Works had an extensive exhibit showing its model 12 heavy duty E-Z lift leaning wheel grader and model 70E-Z lift leaning wheel grader. The model 8 multiple blade maintainer was on the floor. Two motor patrol graders were shown by Galion, both McCormick-Deering powered and carrying scarifiers. One was equipped with rubber track crawlers in the rear and pneumatic tires in front and the other carried full pneumatic tire equipment, duals in the rear and single in front. Three graders were shown by Foote Bros. Gear & Machine Co., a model 80-12 straight wheel grader with front scarifier, a model 35-8 leaning wheel grader and a model 2 Whippet grader. York Modern Corp. exhibited a welded-frame new combination trailer grader, scarifier and rake mounted on rubber-tired wheels. Two triple-service graders, either one-man or two-man operated, were shown by Shaw-Enochs Tractor Co.

Gilbert Mfg. Co. showed a new road-builder, model 2, with automatic leaning wheel grader and a new style scarifier with shanks on the outside for working close to forms and with new self-sharpening teeth. Gilbert also showed a motor grader on eight wheels, the McCormick-Deering power unit being mounted as a flexible six-wheel unit. The grader carries a front scarifier and has an inclosed cab. Sawyer-Massey, Ltd., and American Tractor Equipment Co., both manufacturers of road-making machinery, did not display any equipment but had descriptive literature on hand.

No Steam Rollers Shown

Rollers—For the first time in the history of the road show there was no steam roller exhibited. Austin-Western showed their Cadet 7-ton roller with pneumatic scarifier, Buda powered, and also showed a 10-ton roller with pneumatic scarifier, Hercules powered. A 5-ton roller with rear scarifier and powered by a McCormick-Deering unit was shown by Wehr Co. Galion Iron Works showed two rollers, a Master 10-ton with scarifier and a 5-ton Little Master. Davenport Locomotive & Mfg. Co. exhibited a Davenport - LeTourneau Sheepsfoot roller.

Huber Mfg. Co. showed a new size 8-ton roller, a 5-ton and a 10-ton model all Waukesha powered and equipped with scarifiers. The 8-ton model is full roller-bearing equipped and is hung unusually low at front. The scarifiers are pneumatically operated. A 12-ton Hercules road roller, Hercules powered, and a 6-ton model, Buda powered, were shown by the Hercules Co. Buffalo-Springfield Roller Co. displayed five rollers, 5-ton and 8-ton models equipped with scarifier and grading blade; 10-ton and 15-ton sizes with scarifier and a 10-ton motor tandem roller.

Pneumatic Power Supply

Air Equipment—Several new models and sizes of compressors were exhibited. Curtis Pneumatic Machinery Co. had on hand a 66-ft. size of its new model C portable compressor, high speed, with a Continental engine and mounted on a two-wheel trailer with pneumatic tires. Another new model is a self-contained Climax engine-driven 120-ft. special-purpose compressor. Curtis also showed a new design 90-deg. four-cylinder 6½x5 compressor, 240-ft. size, with no power unit included, and a small compressor for service stations, Fairbanks gas-engine equipped. Four compressors, a drill sharpener and a full line of air rock drills were shown by Gardner-Denver Co. Two of the compressors were portable, one a 310-ft. size and the other a 120-ft. size, both powered by a Buda four-cylinder engine. A Gardner-Denver model, 1,000 V-type, four-cylinder vertical stationary compressor, direct connected to a Westinghouse 40-hp. motor; and a model AAB-1001 two-cylinder vertical compressor direct connected to a Westinghouse 10-hp. motor were shown. A model 3A drill sharpener was connected with a G-D garage-type, two-cylinder compressor driven by a G-E motor. G-D oil-resisting air hose in four-ply, six-ply and three-braid construction was shown in various sizes. A line oiler and a drill steel collaring machine were on exhibition. The Gardner-Denver showing of air tools included a full line of rock drills, pounders and breakers.

Fuller Co. showed a new Fuller Rotary air compressor, rated at 150 ft. at 50 lb. pressure, operating at 900-1,200 r.p.m. No power unit was shown with this machine, which takes a 30-hp. engine. The model shown is a single-stage machine, but Fuller had on hand literature showing this same type compressor in a double-stage type up to 1,400-ft. capacity at 175-lb. pressure. Cleveland Pneumatic Tool Co. showed its line of Cleco air springs for trucks and Cleco multi-powered air brakes.

A line of air-cooled air compressors was shown by Davey Compressor Co. A 142-ft. size was mounted on a Caterpillar 20 tractor, and one of the same size was mounted on a trailer and powered by a Hercules unit. A 110-ft. machine was connected with a Ford Model A engine, mounted on trailer, and a 120-ft. size was on a Fordson tractor, the compressor being run through a power takeoff. Metalweld,

Inc., displayed two Metalweld-Worthington Air King compressors, a new model 110-ft. size mounted on an Allis-Chalmers industrial tractor on four wheels, and a 330-ft, portable model Air King with a Continental engine. A demonstrator, 110-ft. size, portable model with a Continental demonstrator engine was shown.

One Diesel Compressor

Schramm, Inc., showed the only Diesel-driven compressor on the floor in a 360-ft. portable model driven by a Buda M. A. N. diesel engine. The compressor is a four-cylinder machine. A 120-ft., 2-cylinder portable compressor with a Buda gas engine was also shown. A Thor compressor and line of Thor air tools was shown by the Independent Pneumatic Tool Co. The compressor was a 220-ft. portable machine powered by a LeRoi engine, all mounted on a heavy-duty steel wheel trailer. The air tools included contractors' tools, paving breakers, spades, backfill tampers, riveting hammers and grinders. A Thor-Sterling Dual Purpose Compressor truck was shown, equipped with a 120-ft. compressor integral with the LeRoi truck engine. The air-receiver tank was mounted on the left running board of the truck.

Buhl Co. exhibited two of its type WB portable compressors with Wisconsin engines, in the 110-ft. and 220-ft. sizes. A new Buhl type FJ 36-ft. two-cylinder compressor was shown, direct connected through a special coupling with a four-cylinder Fuller & Johnson engine. Cleveland Rock Drill Co. exhibited a full line of rock drills, paving breakers, hand sharpening tools, air hose and couplings, drifters and clay spades. A new model H6 hand sinker drill was shown. This is a light-weight drill weighing 30 lb., and the manufacturer claims two of these drills can be driven off of a 110-ft. compressor. National Brake & Electric Co. showed a special demonstrator model of its type WN 3-cylinder compound, V-type two-stage compressor with a Wisconsin engine.

A new small portable compressor, 36 ft., known as type 30 and driven by a Fuller & Johnson engine, was shown by Ingersoll-Rand Co. A type 20 10x8 portable compressor on rubber tires, 310-ft. capacity and powered by Waukesha, was equipped with an air hoist and an air-driven centrifugal pump. A type 20 5½x5 portable on steel wheels was also shown. This last machine is 110-ft. capacity and is Waukesha powered. Ingersoll-Rand showed its X-71 drifter drill mounted on a three-wheel carriage equipped with an air hoist. This rig is being widely used for open-cut rock drilling. Other I-R exhibits included a cross-section of unloader used on type 20 compressors, a No. 50 drill steel sharpener and a full line of jackhamer drills, paving breakers, pile pounders and miscellaneous pneumatic tools.

Chicago Pneumatic Tool Co. showed two compressors, a CP portable Hercules-driven 110-ft. size and a 120-ft. duplex single-stage, direct connected to a N.W. electric motor on skids. The air tools displayed included Boyer riveting hammers and a line of rock drills, paving breakers, tampers, chipping and calking hammers and grinders and surfacers.

Four compressors shown by Sullivan Machinery Co. included the model WK 314 portable, 310-ft. capacity, on steel wheels powered by Buda. This compressor is a 90 deg. four-cylinder machine. The other compressors were a model WK 312 portable, 110-ft. size, Buda engine; a WK 312 portable 66-ft. size, Continental engine; and a WG-6 7x6 single-stage, 93-ft. size, connected with a 12-hp. electric motor. Sullivan displayed the new Tannertank anti-freeze device that hooks in the main air line to keep the air tools from freezing. A new pavement core drill, equipped with a Leroi engine for truck mounting was shown. A class C sharpener and a GF2 oil furnace were in actual operation at the show. Stringalite Safety Lighting Cable, a new heavy insulated cable with regularly spaced outlet sockets was shown by Sullivan. Small tools and drills on display included a 3 hp. Turbinair hoist for compressor mounting, improved concrete breakers and air spades, a light-weight rotator hammer drill, a T-5 drifter and hand rock drills.

Culvert Pipe Developments

Culverts—A new culvert material, stainless steel, was shown by Toncan Culvert Mfgrs. Association. Two sections of culvert made of this material, one polished and one plain, were on display. The unpolished metal is commercial grade for culverts, and at present costs about seven times as much as Toncan culvert material. The Toncan exhibit included various sizes of standard Toncan corrugated culverts.

The Armco Culvert Mfgrs. Association showed its paved invert Armco corrugated culvert, several sizes of standard Armco culvert and perforated corrugated Armco pipe for subdrainage. The Leadclad Steel Corp. exhibited several Leadclad corrugated culvert pipes and corrugated roofing material. The American Casting Co. showed its Spicor cast-iron spiral light-weight corrugated culvert pipe in several sizes. This company also displayed its Americast Lock-joint cast-iron pipe and a cast-iron headwall made expressly for corrugated culvert pipe.

Pumps—There were few pumps on display this year. Sterling Machinery Corp. showed a new high-pressure four-cylinder road pump, mounted on a four-wheel trailer and powered by a Hercules engine. Sterling also showed two 2-in. pumps, one connected to a Century electric motor and the other driven by a Lausson gas engine, also a 3½-in. size driven by a Lausson engine. Gardner-Denver Co. showed a 3x2x3 steam pump. La Bour, Inc., exhibited three of its line of self-priming centrifugal pumps. One, a 4-in. size portable unit, powered by a Continental engine and mounted on a two-wheel trailer, is new this year. A 4-in. size, powered by a Continental engine, was mounted on a four-wheel trailer, and a 2-in. pump was on skids, connected to an electric motor. New small portable air sump pumps, 2½-in. size, were displayed by Independent Pneumatic Tool Co. and by Chicago Pneumatic Tool Co.

Auxiliary Road Tools

Small Tools—Hand shovels, spades and scoops were shown by Simmons Hardware Co., which also displayed a full line of small tools and wrenches. Skelton Shovel Works, Baldwin Tool Works, and the Wyoming Shovel Works. The National Carbide Sales Corp. showed a line of carbide lights and lanterns, one lantern that can be attached to trucks and construction equipment that shows a red light to the rear. This firm also showed a BD-B Airco gas welding unit. Oil road torches were displayed by Consolidated Iron-Stell Mfg. Co. and by Toledo Pressed Steel Co. Toledo also showed its collapsible pressed-steel horse.

Kerosene-burning concrete-mixer heaters and an all-steel portable tool box mounted on two pneumatic-tired wheels were shown by Littleford Bros. This firm also showed a hand torch for thawing purposes, a squeegee machine and a new hot asphalt joint filler and line marker. Everhot Mfg. Co. showed a line of gasoline-heated branding irons for marking equipment and also bronze nameplates and sidewalk stamps. Hand- and motor-driven tool grinders were shown by Keystone Grinder & Mfg. Co.

DeWalt Products Co. exhibited its line of power saws, portable, hand and stationary. Three models of the Wodak electric hand saw were shown. These small units will saw wood, limestone, brick, tile and other construction materials. The DeWalt Wonderworker saw was shown, mounted on a portable carriage unit. This saw will cut all materials, including metals. A new design three-wheel band saw was also on display. The frame is structural steel, the pulleys are aluminum, and the three-wheel arrangement provides a wide clearance behind the band.

Aeroil Burner Co. showed a power spray unit driven by a Briggs & Stratton engine, a hand weed burner, a hand spray unit and oil burners for tar kettles and road oil distributors. Mohawk Asphalt Heater Co. showed an improved line of oil-burning torches that can be used vertically, concrete heating equipment for both tilting and non-tilting mixers, Hotstuf lead melting pots on legs and on wheels and a trailer tool box on two wheels. Snap-on wrenches, tools, hammers and other small tools were displayed by Snap-on Tools, Inc. W. & L. E. Gurley showed its line of surveying instruments and equipment.

Black & Decker Mfg. Co. showed a line of electric portable drills and grinders. A new Berg Highway surfacer driven by a Wisconsin engine was shown by Concrete Surfacing Machine

Co. This company also exhibited Berg electric and pneumatic concrete surfacers and finishers, Berg cleaning tools for removing paint, rust and scale and a Berg channeling tool for cutting channels in plaster. The new Berg heavy-duty concrete surfacer, motor-driven, mounted on wheels and having a 6-ft flexible shaft, was on display. Lufkin Rule Co. exhibited its line of fine tools and measuring devices. A new road form puller was shown by Moritz-Bennett Corp., consisting of a long lever arm and hook mounted on two wheels. Sauerman Bros. showed their Durolite sheaves in various sizes.

Snow Plows Prominent

Snow-Removal Equipment — Many displays of snow plows reflected the increased attention being paid to snow removal on highways. The Rightway Corp. exhibited a small rotary snow plow attached to the front of a truck and used in connection with a V-plow. The rotary element is mounted on a vertical arm above the V-plow and is operated by a power takeoff from the truck. The rotary swings through a wide angle and can be raised or lowered at will to clean out a heavy drift. Four V type plows were shown by Wausau Iron Works, all new models this year. Model 200XH, consisting of a V front plow and two side plows, was mounted on an FWD truck. The front plow is operated by a hydraulic lift, and the side plows are held by telescoping arms. All of the plows are readily detached so the truck may be used for general purposes. A model 60X with V front plow and side plows, all full hydraulically operated, was mounted on a Caterpillar tractor. A smaller model, 35, with front and side plows mechanically operated, was mounted on a Monarch 35 tractor, and the Wausau Model UCC with front plow only, having no side wings, and hand operated, was mounted on an Allis-Chalmers United tractor.

Klauer Mfg. Co. exhibited its Sno-go rotary snow plow. This unit is a rotary auger blower type, which draws all the snow into a funnel and then blows it out to the side of the road. The machine is powered by a Climax 6-cylinder engine, 175 hp., and is mounted on a special Sno-go truck. An offset V snow plow was shown by Walter Motor Truck Co. mounted on a Walter four-point positive drive truck, powered by a Waukesha motor.

Several truck and grader manufacturers showed snow plows attached to their equipment. Chevrolet Motor Co. showed a snow scraper on its 1½-ton stake body truck model. Dodge Bros. showed a Frink V snow plow, hand controlled from the cab, on a 3-ton Dodge truck, which was also equipped with a Wood 3-yd. three-compartment body and Willett truck grader. Another 3-ton Dodge truck was equipped with a straight snow plow and a Heil 3-yd. dump body. W. A. Riddell Co. showed a snow plow attached to its model 10R rear-control power grader equipped with rubber crawlers. This machine had an inclosed cab and special lights for night work. Baker Mfg. Co. showed a V snow plow with side scrapers mounted on an Allis-Chalmers 35 tractor, hydraulically operated.

The chemical snow-removal process developed by Professor Barnes was on display by Sno-Melt, Inc. The Joy Mfg. Co., makers of the Joy snow loader, showed no equipment but had an exhibition of motion pictures and literature.

Traffic Control Equipment

Signs and Signals—A new device in traffic signaling was introduced by Automatic Signal Corp. This firm has developed an installation for use at heavy traffic points for the protection of pedestrians. A pedestrian wishing to cross a heavily traveled street or highway pushes a button installed on a pole and receives a light permitting him to cross. Street traffic is also protected in that it is held up only a short time regardless of how much the pedestrian button is pushed. A model of this installation was on display as well as the Automatic Signal Corp.'s full vehicle-actuated traffic-control system, which is automatically controlled by approaching vehicles. A model of the company's traffic-counting equipment was also shown. Traffic lights were exhibited by the National Traffic Signal Co., who introduced a new master timer to be used in connection with traffic signals and also a new type yellow or caution light that indicates the amount of time left to clear an intersection before the light changes. The American Gas Accumulator Co. showed two traffic signals with new timing devices. The A.G.A. also showed a new 500-mm. 3-kw. incandescent airport floodlight.

Battery-operated flasher lights were shown by Wallace & Tiernan Products Co., Louisville Frog, Switch & Signal Co. and Welsbach Traffic Signal Co.

Reflector signs, buttons and metal road signs were shown by American Gas Accumulator Co., Ray-Signs Corp., Libbey Cataphote Corp., S. G. Adams Co., Wallace & Tiernan Products Co., Louisville Frog, Switch & Signal Co., Welsbach Traffic Signal Co., Grimm Stamp & Badge Co., and the National Colortype Co. Libbey Cataphote Corp. introduced a new Cat-Eyes reflector button that will pick up a light in range of 150-deg. This button can be incorporated in any type of metal sig or can be superimposed over existin signs. Thomas E. Collins & Compan showed a new double-faced fabriko sign that can be used for direction o warning signs. American Steel & Wir Co. showed several steel fence and sig posts, and the Shunk Mfg. Co. had on hand a line of steel traffic-lane marker

Highway Service Equipment—Rom Mfg. Co. showed a new one-man, self propelled mower on three wheels, oper ated by a two-cylinder gas engine Gilbert Mfg. Co. introduced a highway mower weed-cutter of new design, con sisting of fast rotating multiple knives that thrash the weeds and cut them up fine. The mower is adjustable to any angle cut and is powered by a McCor mick-Deering engine. Rawls Mfg. Co. exhibited a mower attachment for a caterpillar 10 tractor and a draft high way mower, gas engine driven.

National Traffic Guard Co. exhibited its metal-band highway guard rail, con sisting of a ⅛-in. steel band 12 in. wide which is attached to wood posts by a galvanized-iron shock unit. Johnson Motor Co. showed the Johnson Motor scythe, a motor-driven hand-propelled mower with a 3-ft. sickle, driven by a single-cylinder Johnson engine.

Cable and wire highway guard rails were displayed by the American Wire Fence Co., in its Life-net road guard fence; the Cyclone Fence Co.; the Wickwire Spencer-Steel Co.; the American Steel & Wire Co.; the Page Steel & Wire Co.; Broderick & Bascom Rope Co.; and Malleable iron fittings for cable guard rails were shown by the Malleable Iron Fittings Co., and the Truscon Steel Co. showed a new line of all steel highway guard posts. Wej-Lock Mfg. Co. showed fittings for highway cable guard rail.

Stone and gravel spreaders were exhibited by the Goroco Mechanical Spreader Co. and Highway Services, Inc. The Goroco exhibit included a separate spreader unit for truck attachment. The machine has a full-width hopper, a revolving disk distributor, a manual-controlled diaphragm hopper gate with the opening always centered over the disk, and the whole is mounted on two hard-rubber-tired wheels. Three spreader machines were shown by Highway Service, Inc. The model 80 Handy Sandy mechanical spreader, operating on the roll and brush principle, is for large trucks. A smaller model, 66, for light trucks was also displayed. This company introduced its new Handy Rol-Roc mechanical spreader for larger stone or bituminous and macadam work. The roller of the Handy Rol-Roc is made of "Knobby Floor Plate," and this machine will spread stone from 1 to 8 in. deep. Burch Corp. showed a drag stone spreader with an extension gate over the regular gate for fine surfacing. Galion Iron Works & Mfg. Co. also exhibited a stone spreader.

This description of exhibits at the St. Louis Road Show will be concluded in next week's issue.

Road Show Notes

Diesel engines apparently stayed out of the show along with the heavy shovel equipment. Only one piece of equipment on the floor was powered by a diesel engine, and only three engine manufacturers showed diesel and oil engines.

Judging from the interest shown by visitors, the innovation of describing machine performance by use of talking pictures, shown by three exhibitors, was a decided success.

Rubber crawler tracks were described by one exhibitor showing them as "the biggest thing this year in new traction equipment."

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Location	Project	Cost	Status
Waterworks			
Louisville	Reservoir, etc.	$1,500,000	Proposed
Excav. & Dredging			
Victorville (Calif.)	Irrigation project	$1,500,000	Proposed
Subways			
New York	Subway	40,000,000	Proposed
Sports and Parks			
Jersey City	Stadium	2,000,000	Proposed
Unclassified			
Massachusetts and Rhode Island	Oil pipe line	1,000,000	Proposed
Maspeth (N. Y.)	Terminal	2,000,000	Bids asked
Factories and Mills			
East Chicago (Ind.)	Steel Mill	5,000,000	Proposed
Ft. Worth	Steel plant	3,000,000	Proposed
Power Plants			
Marble Falls (Tex.)	Power plant and dam	3,400,000	Bids asked
Warehouses			
White Plains	Warehouse, etc.	1,000,000	Proposed
Buildings			
Atlantic City	Hotel	1,000,000	Bids asked
Brooklyn	Hotel	1,250,000	Bids asked
New York	Apartment	8,000,000	Contracts
West Lafayette (Ind.)	Church	1,000,000	Proposed
New York	Hospital	3,000,000	Proposed
Racine (Wis.)	Hospital	1,500,000	Proposed
Hillside (N. J.)	Medical	1,500,000	Proposed
Rochester (N. Y.)	College	1,000,000	Bids asked
Perth Amboy (N. J.)	Theatre	1,000,000	Bids asked
New York	Theatre	1,000,000	Contract
Elgin (O.)	Theatre	1,000,000	Proposed
St. Louis	Bus terminal and hotel	1,500,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Hayward—For 1 m.g. concrete covered storage reservoir. J. B. Holly, city engr.

Calif., San Jose—City, concrete gravity section dam, 55 ft. high, 50 ft. wide at base, 210 ft. wide at top, in Alum Rock Park at Cherry Flats. $50,000. W. Popp, city engr.

Ill., Peoria — Peoria Waterworks Co., 105 North Monroe St., R. Crozier, vice-pres., water main extensions, 1 mi. long, ¼ to ½ mi. wide, in Bartonville Bluff Dist. $75,000.

Ky., Louisville—Louisville Water Co., 435 South 3rd St., 30 m.g. reservoir, necessary equipment, piping, part of which to be 48 in. pipe. $1,500,000. J. Chambers, 435 South 3rd St., engr.

Mass., Middleboro — Town, waterworks in North Middleboro. $15,000 or more. Engineer not selected.

Mass., Natick—Dpt. P. Wks., c/o J. Penell, Middlesex Ave., relaying mains in Worcester St. et al. $15,000.

Mass., Weston — New water-mains from Stoney Brook. $12,000 appropriated. Est. $15,000 or more.

Mo., St. Louis—St. Louis Water Dpt., preliminary plans 5 m.g. rein.-con. covers on 2 water reservoirs on Compton Hill, Grand Blvd. between Russell Blvd and Lafayette Ave. $360,000. L. Day, City Hall, comr.

N. J., Hammontown—Bd. Town Council, Town Hall, preliminary plans extending mains in Main Rd., Pratt, Liberty, Bway., Peach, Vine and Grape Sts., $27,000. J. A. Baker, town engr.

N. J., Manville—Bd. Boro Council, Boro Hall, municipal chlorinating plant. $25,000. C. J. Kupper, 409 East Main St., Somerville, engr.

N. J., Paterson — Textile Dyeing Co. of America, Wagaraw Rd., 1 story filtration plant, Wagaraw Rd. $140,000. Project in abeyance. Noted Oct. 17, 1929.

O., Napoleon—Bd. Control soon takes bids 10 in. main from municipal water plant to business section. $25,000.

Okla., Leede—Preliminary plans water softening plant. $20,000. F. H. Parks, mayor.

Pa., Waynesburg — Waynesburg Water Co. (subsidiary Community Water Service Co., P. S. Wilson, supt. operations, 46 Cedar St., New York), H. T. McClelland, local mgr., 75 m.g. impounding dam.

R. I., Barrington—Bristol and Warren Waterworks Co., Bristol, distribution system. To exceed $15,000. Private plans.

Tex., San Antonio—San Antonio Water Bd., 106 Market St. 2½ m.g. rein.-con. water tank, on east side. $125,000.

Tex., Yoakum — City, c/o Secretary, bids about Feb. 1, waterworks. $410,000. Montgomery & Ward, Snider Bldg., Wichita Falls, engrs. Noted Jan. 8.

Ont., Burlington—For 1.5 mi. 6 in. mains in Freeman Ave. $18,500. G. H. Power, Watson St., Oakville, engr.

Ont., Fort Frances — Town, moving waterworks pump house from Rainy River to Rainy Lake, incl. 900 ft. 30 in. intake, 9,600 ft. 12 in. piping, intake crib, new pumping unit; moving existing pumps, valves, etc. $105,300. D. J. Dillon, city engr. Noted Dec. 11.

Ont., Thessalon—Town, 150 ft. concrete storage dam, 35 ft. high, in connection with owner's hydro plant. $25,000. James, Proctor & Redfern, 36 Toronto St., Toronto, engrs.

Ont., Toronto—York Twp., 6 in. c.i. mains in Westbury Crescent, Halford Ave., Cowan and Glenhaven Sts., 12 in. c.i. mains in St. Clair Ave. and Elora Rd. $21,756. F. B. Goedike, 40 Jarvis St., engr.

Ont., Welland—Stamford Twp., 2 mi. 6 in. mains in St. Mary's St. and Drummond Rd. $200,000. M. F. Ker, 1810 Ferry St., Niagara Falls, engr.

BIDS ASKED

Calif., Madera—Feb. 2, by J. Wakefield, city clk., 3,500 ft. 6 in. c.i. pipe 150 lb. working pressure, with fittings, or McWane pre-caulked c.i. pipe and fittings.

La., Hammond—Feb. 3, by City Council, furnishing, laying mains, installing 1,000 dual drive fire pump or repairing present pump. H. T. Richardson, Hammond, engr.

Mass., Chicopee — Jan. 28, by City Water Dpt., City Hall, 1 story, brick, concrete filtration plant addition. $200,000. Morris-Knowles, 200 9th St., Pittsburgh, Pa., engrs.

Mass., Winthrop (br. Boston) — See "Contracts Awarded."

Mich., Detroit—Feb. 3, by Bd. Water Comrs., D. Grobbel, acting secy., furnishing, laying 5,690 ft. 66 in. lockbar, hammer welded, electrically welded or riveted water pipe, steel, armco ingot iron or toncan molybdenum iron plates, ¼ in. thick, in Warren, Kingsley and Blesser Aves. between Indiana Ave. and Coolidge Hy.; also furnishing, installing 3 electric elevators for power structures and pumping station, Springwells Station, with accessories. G. H. Fenkell, 735 Randolph St., engr.

Miss., Laurel—Jan. 26, by City Council, 9,000 lin. ft. 12 in., 1,000 lin. ft. 8 in. and 1,000 lin. ft. 6 in. Class B bell and spigot c. i. pipe, twenty 4- to 12-in. hubbard and gate valves, 10 fire hydrants, 8,000 lb. pig iron.

Minn., Minneapolis—Jan. 27, by F. S. Gram, city purch. agt., one 30 in. gate valve and one 30 in. chuck valve. N. W. Elsberg, city engr.

Minn., St. Cloud—Jan. 27, by G. M. Atkinson, city clk., furnishing 12,000 lin ft. 12 and 16 in. c.i. mains.

N. J., Mount Holly—Jan. 30, by Bd. Freeholders Burlington Co., Court House, 16 in. diam. artesian well, with electrically operated vertical turbine pumps. H. B. Smith, Mount Holly, co. engr.

N. Y., Buffalo—Jan. 30, by G. S. Minnis, engr., 1036 Ellicott Sq., water-main changes in connection with elimination of Amherst-Austin and Tonawanda St. grade crossings, incl. 185 tons c. i. water pipe, 10 tons c. i. fittings, 2 tons steel pipe, 5,300 ft. 4- to 6-in pipe laying, forty 4- to 6-in. valves, 10 hydrants, service connections, for City of Buffalo.

N. Y., New York—Jan. 27, by J. J. Dietz, comr. Water Supply Gas & Electricity, Municipal Bldg., mains in Katonah and McLean Aves., East 235th and East 240th Sts.

O., Cleveland Heights—Jan. 23, by City, 1 m.g. water storage tank, 10,000 gal. pressure tank. $20,000. F. A. Pease Eng. Co., Terminal Tower, Cleveland, city engr. Noted Sept. 4.

B. C., Vancouver—Feb. 9, by City Council, 65,000 ft. 6 and 8 in. Class C and D c.i. pipe. $30,000. C. Brackenridge, city engr.

CONTRACTS AWARDED

Calif., Inglewood—City, to National Cast Iron Pipe Co., 417 South Hill St., Los Angeles, furnishing, delivering 5,000 ft. 4 in. c.i. water pipe at $0.447 per ft., 2,000 ft. 6 in. $0.638, 1,200 ft. 8 in. $0.914, 1,000 ft. 10 in. $1.23.

Calif., Los Angeles—City Purchasing Agent, to Western Pipe & Steel Co., 5717 Santa Fe Ave., 1,560 ft. 51 in. welded steel pipe at $6.55 per ft., 1,560 ft. 51 in. welded steel pipe double dipped in McEverlast steel water pipe coating $6.35, 1,560 ft. 51 in. welded steel pipe (not more than 2 girth seams, and 1 longitudinal seam) $7.05, 1,560 ft. 51 in. welded steel pipe (not more than 2 girth seams and 1 longitudinal seam) dipped in McEverlast steel water pipe coating $6.85.

Calif., Oakland—East Bay Municipal Utility Dist., furnishing pumping plant for El Cerrito Booster Plant using Westinghouse reactor motors, to Byron-Jackson Pump Mfg. Co., Berkeley, $4,221.

Calif., Santa Cruz—City Comn., 7,700 lin.ft. 20 in. pipe for municipal water plant extensions, to U. S. Pipe & Fdry. Co., Monadnock Bldg., San Francisco, at $3.50 per ft.

See proposal advertising on page 104

Constr. News page 27

LEADITE

Water Works Men Specify and Use LEADITE with "Confidence"

Laying 30-in. cast iron bell and spigot pipe with LEADITE JOINTS under 42 R.R. Tracks. 5 foot cover base of rail, and pipe unprotected.

CONFIDENCE,—a word often used, and probably more often "abused."

THE DICTIONARY DEFINES CONFIDENCE AS—

Assurance of mind, or firm belief in the good-will, integrity, stability, or veracity of another, etc.

Water Works Men have had the CONFIDENCE to Specify and Use LEADITE for thousands of miles of cast iron bell and spigot water mains of various sizes.

CONFIDENCE, as we see it, can ONLY EXIST as the result of a QUALITY PRODUCT, plus a SERVICE WELL RENDERED, plus FAIR DEALING over a period of years.

We naturally like to believe that the widespread usage of LEADITE throughout the Country, is based upon CONFIDENCE,—at least, we try to make it so.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - - Philadelphia, Pa.

No Caulking

Waterworks (Continued)

Ind., Peru—Drilling artesian well, to Sewell Wells Co., 1627 Locust St., St. Louis, Mo., $28,826.

Kan., Arlington—General work, incl. 5,100 ft. 2 in., 13,500 ft. 4 in. and 3,870 ft. 6 in. c. i. pipe, 5,000 lb. c. i. specials, 24 gate valves, 27 fire hydrants, 2 brick pump houses, two 60 g.p.m. deep well pumps with motors, two 60 ft. wells to Carter Constr Co., Tulsa, Okla., $27,088; meters, to Badger Meter Mfg. Co., 412 Interstate Bldg., Kansas City, Mo., $11 each; fire hose, to Eureka Fire Hose Mfg. Co., 1114 Midland Bldg., at $0.95 per ft. Est. $32,000. Noted Dec. 25.

Kan., Johnson City — Well and pump, to United States Engine & Pump Co., 1100 Hickory St., Kansas City, Mo., $3,165. Rejected bids grading, curbing, guttering. Noted Jan. 8.

Mass., Wellesley — Town, pumping station addition, Worcester St., to Hill & Delaney, 108 Massachusetts Ave., Boston.

Mass., Winthrop (br. Boston)—Town, c/o Bd. Selectmen, new main in Revere St., day labor, $45,000 appropriated. Noted Dec. 11.

Minn., Minneapolis—F. S. Gram, city purch. agt., to Amer. Cast Iron Pipe Co., 712 Plymouth Bldg., Minneapolis, 48,000 lin.ft. 6 in. c.i. pipe at $0.705 per ft., 14,000 ft. 8 in. at $0.9825, 3,200 ft. 12 in. at $1.655, 2,000 ft. 16 in. $2.56, total $58,011; to Amer. Brake Shoe & Fdry. Co., 317 37th Ave. N. E., manhole frames at $36 per ton; to General Chemical Co., 300 West Adams St., Chicago, Ill., 3,600 tons alum for filtration plant at $1.27 per ton; to Baker Valve Co., 1847 East 28th St., specials at $60 per ton. Noted Jan. 1.

Mo., Clarkton—City Clerk, 12,200 ft. 4 and 6 in. c.i. pipe, to McWane Cast Iron Pipe Co., 208 South LaSalle St., Chicago, Ill.; pump, to Stewart Mchy. Co., Buder Bldg., St. Louis; pump house, to N. E. Douglas, Clarkton. Noted Dec. 11.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Nassau and Kissena Blvds. to Oakhill Contg. Co., 46-50 Highland Rd., Douglaston. $684,500. Noted Jan. 1.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Mosholu Parkway, to Knidem Contg. Corp., 4197 Park Ave., $6,755. Noted Jan. 1.

N. C., Roanoke Rapids—Roanoke Mills, filter plant, to C. M. Guest & Son, Anderson, S. C., $63,000.

Wis., Neenah—For 600,000 gal. elevated steel water tank, to Pittsburgh—Des Moines Steel Co., Tuttle and S. W. 10th Sts., Des Moines, Ia. $27,000.

B. C., Vancouver—City Council, five 18 in. gate valves, to A. J. Forsyth & Co., 1080 Hamilton St., $1,448; 100 standard hydrants, to Terminal City Ironworks, 1949 Franklin St., $6,000. Noted Dec. 18.

Ont., Alexandria—Town, supplying equipment, motor, pumps, for waterworks, to Layne Canadian Water Supply Co., Ltd., Metropolitan Bldg., Toronto. Est. $25,000. Noted Dec. 4.

Ont., Ancaster—Township, digging well; supplying pump, to Jordan-Roberts Sales Ltd., Morrell St., Brantford, $6,300; steel standpipe, to Horton Steel Wks. Ltd., Northern Ontario Bldg., Toronto, $6,173; foundations for standpipe, to W. B. Russell, Hermant Bldg., Toronto, $997; valves and hydrants, to Canada Valve & Hydrant Co., Morrell St., Brantford, $1,408; 6 in. c.i. mains, to Gartshore-Thomson Pipe & Fdry. Co., Stuart St. W., Hamilton, $7,972. Grand total $22,850. Est. $30,000.

Ont., Ottawa—Secretary Bd. Control, equipment for new waterworks filtration plant, incl. venturi meters, master control meters, rate controllers, hydraulic valves, gate valves, sluice gates, etc., to W. J. Westaway & Co. Ltd., Hamilton, $142,840. Noted Dec. 4.

SEWERS

PROPOSED WORK

Calif., Capitola — Soquel-Capitola Sanitary Dist., 1,500 ft. 12 in. probably c.i. and wrought iron outfall sewer, 2 pumping plants, 1 screening plant. $56,000. L. Bowman, Courthouse, Santa Cruz, engr.

Calif., Hayward—Surveys sewer extensions in area southwest of Western Pacific R.R. and C St. $25,000 or more. J. B. Holly, town engr.

Calif., Santa Maria—Sewer extensions. $25,000. City Engineering Dpt., engrs.

Colo., Swink—Bids in February sanitary sewerage system, $25,000. A. A. Weiland Eng. Co., 1st Natl. Bank Bldg., Pueblo, engrs.

Conn., Middletown — Preliminary surveys, studies sewage disposal plant. To exceed $25,000. T. F. Bowe, 110 William St., New York, engrs.

Conn., Shelton—State of Connecticut, Hartford, new sewerage system at Laurel Heights Sanatorium. $30,000. E. J. Lynch, supt.

Ill., Vandalia — State of Illinois, Capitol Bldg., Springfield, rejected bids sewage treatment plant, sewers, water mains, drilling well, erecting brick, concrete pump house at Illinois State Farm. Will readvertise. Division of Architecture & Eng., Capitol Bldg., Springfield, engrs.

Ill., Woodriver—Replacing present sewer with new sewer. $40,000.

Ind., Lawrenceburg—For 4 mi. sanitary sewerage system, and sewage disposal. $150,000.

Kan., Hutchinson—Preliminary plans sewerage system, sewage disposal plant. $400,000.

Kan., Parsons—Rejected bids 10,000 ft. main and lateral sewers, booster pump station. H. E. Glaze, City Hall, engr.

N. J., Hasbrouck Heights—Bd. Boro Council, Municipal Bldg., renovating and altering sewage disposal plant. $25,000 or more. Engineer not selected.

N. J., Pleasantville — Bd. City Council, City Hall, preliminary plans storm water sewer along Hy. Route to Fox's Basin, and extension of sanitary sewer along same route. $25,000.

O., Beloit—Mahoning Co., sanitary sewers to connect with sewage disposal plant for Beloit and Sebring. $25,000. G. F. Turner, Youngstown, co. engr.

O., Canton—Bd. Control sanitary sewer in Denver St. into East 4th St. and Ohio River. $25,000. F. Clapsaddle, East Liverpool, engr.

Okla., Miami—Preliminary plans storm sewers in business section. $35,000. W. L. Rush, mayor.

Tex., Houston — City, c/o W. E. Monteith, mayor, storm sewers, drainage in Telephone Rd. from Lawndale to Southern Pacific R.R. tracks. $120,000. J. M. Nagle, city engr.

Wis., Monroe — Village, sewage treatment plant. $60,000. L. H. Kessler, Madison, engr. W. S. Shields, 222 North Wells St., Chicago, Ill., consult. engr.

Ont., Hamilton — Soon takes bids 1.5 mi. vitr. clay sewers in Sherman Ave., Wellington, East 16th and East 17th Sts. $88,299. W. L. McFaul, city engr.

Ont., Hamilton—For 1 mi. 8 in. vitr. clay sewers in 19th, East 34th and Wentworth Sts. $40,121. W. L. McFaul, City Hall, engr.

Ont., Milton—Town 1.5 to 2 mi. 8 in. and up vitr. tile storm and sanitary sewers in Foster, Pine and Sarah Sts. $30,000-$40,000. G. H. Power, Watson St., Oakville, engr.

Ont., Toronto—East York Twp. 1 mi. 8 in. and up vitr. clay storm and sanitary sewers in Bennington Heights Dr. $28,273. G. R. Jack, 443 Sammon Ave., engr.

BIDS ASKED

Calif., Los Angeles—Feb. 2, by M. Beatty, clk., Los Angeles Co., 5.73 mi. sewers in Alston St., et al. To exceed $50,000.

Kentucky—Feb. 18, by State Hy. Comm., Frankfort, improving Clarks River Bridge, incl. two 126 ft. and one 160 ft. steel truss spans, one 60 ft. steel I-beam span on concrete piers, abutments, Federal Aid Project 207-AB, McCracken Co. B. Johnson, chn.

New Jersey—Feb. 5, by Joint Meeting village of South Orange, Roselle Park Boro, cities of East Orange, Newark and Summit, towns of Irvington and West Orange, and Hillside, Maplewood, Millburn and Union Twps., Contr. "C," Sect. 2, Supplementary joint trunk sewer. Alexander Potter, 50 Church St., New York, ch. engr.; adv. E. N.-R. Jan. 22.

N. J., Newark—Feb. 18, by Passaic Valley Sewerage Comrs., 24 Branford Pl., 783 lin.ft. 11 ft. 9 in. main intercepting sewer in compressed air tunnel, other appurtenant work. J. H. Quigg, clk.; adv. E. N.-R. Jan. 22.

N. Y., Attica—Feb. 10, by Dpt. Correction, State Office Bldg., Albany, sewers, water lines at Attica State Prison; adv. E. N.-R. Jan. 22.

N. Y., Babylon — Feb. 5, by Long Island State Park Comn., Administration Bldg., Belmont Lake State Park, two 62,500 gal. rein.-con., septic tanks at Jones Beach State Park. W. E. Andrews, acting ch. engr.; adv. E. N.-R. Jan. 22.

N. Y., Long Island City—Jan. 26, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., sewers in Dorothy Pl., Quencer Rd., Queens and Sutphin Blvd., Jansen, Juniper, 75th, Yellowstone, Woodhaven, 36th (Lamartine), 39th, Jamaica, 91st, 89th, and Hillside, Pitkin Aves., 215th, 211th, 210th, 185th, 186th, 125th, 86th Sts.

N. Y., St. George—Jan. 28, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Cleveland Ave. from 2nd to 1st Sts.

S. D., Arlington — Feb. 2, by City, 20,700 lin.ft. 7 and 12 in. sewer pipe, 51 manholes, 1 disposal plant. $35,000. W. E. Buell & Co., 337 Insurance Exch., Sioux City, Ia., engrs. Noted Mar. 13.

Ont., Fort William—See "Contracts Awarded."

Ont., Kitchener—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Middletown—City, constructing Durant District Sewer, day labor. Former contract rescinded. Noted Jan. 8 under contracts awarded.

La., New Orleans—Sewerage and Water Bd., at office A. G. Moffat, secy., 526 Carondelet St., Contr. 118-D, Pumping Station and Drainage Suction and Discharge Basin No. 7, Florida Ave. and Orleans St., to G. F. Favrot, Baltar Bldg., $110,703. Noted Nov. 6.

Md., Baltimore—Bd. Awards, sanitary sewers and storm drains, Storm Water Contr 160, to D. C. McAleer, Lexington Bldg., $145,309. Noted Jan 12 Daily.

Md., Baltimore—Bd. Awards, sanitary sewers in Sanitary Contr. 273, to D. Cellinese, 213 South High St., $16,962.

Miss., Greenville—Storm sewers in southeast section city, to J. R. McCrary Citizens' & Southern Bank Bldg., Atlanta, Ga., $33,426.

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., furnishing, installing drainage equipment for Line A from Fulton to 207th Sts. for Independent Subway System City-Owned Rapid Transit Railroads, to Welsh Bros. Contg. Co., 35 Purvis St., Long Island City, $140,000. Noted Dec. 18.

O., Cleveland—Sewer in Ivanhoe Rd., to D. Iafornaro, 2751 Noble Rd., $12,634; Superior Ave., to A. Marra Co., 4537 Lee Rd., $26,269. Noted Dec. 26.

O., Columbus—Franklin Co., Court House, 16,815 ft. rein.-con. and concrete sanitary sewer in District Franklin I. Impvt 75, to Connelly Bros., 136 East Broad St., $143,110.

O., Medina—Village, 4,000 ft. 18- to 24-in. pipe line for sewage disposal plant, to Northland Constr. Co., Toledo, $21,519. Noted Dec. 18.

R. I., Newport—City, extension of sewerage system, Spring St., to Hudson Constr. Co., 129 Bellevue Ave. $30,000-$40,000.

Tenn., Knoxville—W. S. Mynatt, dir. Pub. Serv., Broadway Lateral No. 2, 69,916 lin.ft. 8- to 12-in. sewers, also wyes, manholes, to Emory Constr. Co., Empire Bldg., $91,986. Est. $125,000. Noted Dec. 25.

Wis., Milwaukee—Sewerage Comn., vapor condensers for dryer house of sewage disposal plant, to Schutte-Koerting Co., 12th and Thompson Sts., Phila., Pa. $34,445.

Ont., Fort William—City, 12- to 24-in. vitr. tile and 5 ft. concrete sewer in McVicar and Gore Sts., Mountain, Center, Euclid and Wallbridge Aves., day labor. $94,898. Noted Dec. 4.

Ont., Grimsby — Town, 5,000 ft. vitr. tile pipe, to Natl. Sewer Pipe Co., Metropolitan Bldg., Toronto; 2,000 ft. concrete pipe, to Dominion Lock Joint Pipe Co., Glengrove Ave. W., Toronto; laying and installing pipe, to J. D. Armstrong, 27 Alanson St., Hamilton. Est. $30,000. Noted Dec. 11.

Ont., Hamilton—To Stanley Contg. Co. Ltd., For 4,651 ft. rein.-con. trunk sewer in Main, Poulette, Hunter, Locke and Dundurn Sts. and 2,347 ft. in Robinson St., to Stanley Contg. Co. Ltd., 400 Gage Ave. N., $142,400 and $43,466 respectively; 2,676 ft. Hunter, Queen, Rolf and Hess Sts., to Hamilton Contg. Co. Ltd., 25 Hughson St. S., $50,786. Grand total $236,652.

Ont., Kitchener—City Council sewer extensions in Arnold St. and drainage system in Spring Valley Rd., day labor. $35,000. S. Shupe, city engr.

Ont., Ottawa—City, City Hall, ¼ mi. 7 ft. tunnel sewer from Ottawa River to Cathcart Sq., to McDougall Bros., Besserer St. $122,823.

Ont., Toronto—City, to J. Formica & Co., 365 Northcliffe Blvd., brick trunk sewer in Simcoe St. $86,900, lane north of St. Clair Ave., $750, Glencairn Ave. $3,625; to C. Moreno, 1 Orchard Park Blvd., lane near Northumberland Ave. $1,489; to J. Maguire Contg. Co., 24 Birch Ave., Rosedale Relief Sewer, Sects. A B C and D. $95,788. Grand total $188,552.

Que., Montreal — City, Perras Sewer, to Foundation Co. of Canada Ltd., 1538 Sherbrook St. W. Est. $500,000.

BRIDGES

PROPOSED WORK

Calif., Santa Barbara — Santa Barbara Co., 500 ft. steel bridge, 22 ft. wide over Rogue Creek. $50,000. O. H. O'Neill, Santa Barbara, co. surv.

Calif., Stockton—Bd. Comrs. San Joaquin Co., Garwood Ferry Bridge over San Joaquin River. $70,000. J. Manthey, Stockton, co. surv.

Colorado and Utah—See "Railways."

Ga., Atlanta—City, C. Donaldson, City Hall, reconstructing bridge over railway tracks at Broad St., $68,500. C. E. Kauffman, city engr.

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Bridges (Continued)

Maine—State Hy. Comn., Augusta, Cumberland Co. (Topsham) and Sagadahoc Co. (Brunswick) take bids in February, bridge over Androscoggin River. To exceed $25,000.

Massachusetts—City of Boston, Dpt. P. Wks., preliminary plans rein.-con. steel bridge over Mystic River from Charlestown to Chelsea. $150,000. J. E. Carty, Boston, City Hall, engr.

New Jersey—Bd. Freeholders Middlesex Co., Court House, New Brunswick, steel, concrete bridge over South River between Sayreville and South River. $25,000. W. F. Buchanan, Court House, New Brunswick, co. engr.

N. Y., Brewerton—Dpt. P. Wks., A. W. Brandt, comr., Albany, Oneida River Bridge, concrete. $400,000. G. W. Pinck, Syracuse, dist. state engr.

O., Youngstown—City Br. reconstructing Mahoning Avenue Bridge. $50,000.

R. I., Providence—For 65 ft. steel concrete bridge, 40 feet, Eagle St. and Quinsley Ave. $25,000. S. F. Nolan, City Hall, engr.

Tex., Beaumont—Southern Pacific Ry. Co., G. W. Boschke, ch. engr., 65 Market St., San Francisco, Calif., bridge across intercoastal canal in Jefferson Co. $162,000.

Ont., Orillia—City Council, bridge over Canadian National Ry. from Matchedash to Front Sts. $30,000. A. Kilburn, Ontario Ry. Bd., Toronto, engr.

BIDS ASKED

Calif., Santa Monica — Jan. 28, by C. H. Purcell, engr. State Hy. Comn., Sacramento, widening bridge over Topanga Creek, by constructing eight 27 ft. timber spans on pile bents adjoining existing concrete bridge, grading, asphaltic concrete surfacing approaches, also widening bridge over Las Flores Creek, by constructing 2 rein.-con. girder spans on concrete piers, concrete abutments, grading, asphaltic concrete surfacing approaches, both Los Angeles Co., near here.

Idaho—Jan. 27, by R. H. Shoemaker, acting comr. P. Wks., Boise, four 75 ft. arch span bridge over Boise River, Ada Co.

Illinois—Feb. 4 by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, one 36 ft. and two 33 ft. span rein.-con girder bridge, Route 5, Sect. 7-YV—two 46 ft. spans rein.-con. girder bridge, Route 46, Sect. 464-H—one 30 ft., one 44 ft. and one 36 ft. span rein.-con. girder bridge, Route 51, Sect. 511-VB, one 46 ft. and two 26 ft. span steel I-beam bridge, Route 58, Sect. 683-SB, all Cook Co.—one 24 ft. span slab bridge, two 50 ft. span rein.-con. bridge, Route 6, Sect. 2-YB DuPage Co.—two 15 ft. span rein.-con. girder bridge, Route 48, Sect. 114-B Ford Co. — one 40 ft. rein.-con. substructure, Route 85, Sect. 102-B—100 ft. steel superstructure, Route 85, Sect. 102-C—rein.-con. substructure, Route 85, Sect. 103-B—100 ft. steel superstructure, Route 85, Sect. 103—Cone 50 ft. span rein.-con. girder bridge, nine 50 ft. span rein.-con. substructure and I-beam approach spans, Route 85, Sect. 104-B 80 ft. steel superstructure, Route 85, Sect. 104-C—all Mercer Co.—rein.-con substructure and two 40 ft. span rein.-con. girder approach spans, Route 120, Sect. 101-B—100 ft. steel superstructure, Route 120, Sect. 101-C—rein.-con. substructure and six 43 ft.—I-beam approach spans, 1 rein.-con. culvert, Route 120, Sect. 102-B—120 ft. steel superstructure, Route 120, Sect. 102-C—five 43 ft. span steel I-beam bridge on concrete piles—four 43 ft. span rein.-con. substructure and I-beam approach spans, Route 120, Sect. 103-B—100 ft. steel superstructure, Route 120, Sect. 103-C, all Logan Co.—rein.-con. box culvert, six 50 ft. span rein.-con. girder bridge, Route 120, Sect. 113-B DeWitt Co.—40 ft. steel I-beam rein.-con. girder bridge, two 35 ft. span rein.-con, substructure and seven 40 ft. I.beam approach spans, Route 120, Sect. 115-B—120 ft. steel superstructure, Route 120, Sect. 115-C—all Piatt Co.—three 40 ft. span rein.-con. girder bridge, Route 121, Sect. 134-B, Logan Co. F. T. Sheets, ch. hy. engr.

Louisiana—Feb. 10, by State Hy. Comn., Baton Rouge, Ranch Canal Bridge on Houma-Chauvin Hy., Terrebonne Parish—Little Tensas Bayou Bridge, on Lake Providence-Gassoway Hy., East Carroll Parish—Old River Bridge at Montrose, Natchitoches-Boyce Hy., Natchitoches Parish—Bayou Grossetete Bridge, Port Allen-Livonia Hy., Pointe Coupee Parish—overpass on Bunkie-Cheneyville Hy., Avoyelles Parish. W. H. Norckauer, hy. engr.

Massachusetts—Jan. 27, Dpt. P. Wks., Boston, general repairs to superstructure, draw span and draw machinery of bridge over Acushnet River, Fairhaven and New Bedford. A. W. Dean, c/o owner, engr.

Mo., Boonville—Feb. 16, by Missouri, Kansas & Texas R. R. Co., F. Ringer, chr. engr., Railway Exch. Bldg., St. Louis, superstracture bridge across Missouri River. Noted Jan. 1.

N. Y., Buffalo—Jan. 27, by W. G. Hickman, engr. Erie Co., 29 County Hall, concrete slab bridges, on Duerr Rd., C. R. 463, Project 96, East Hamburg, on Dalameter Rd., C. R. 477, Project 97, Evans; widening one 17 ft. span bridge and constructing 10 ft. span bridge on Whitehaven Rd., C. R. 75 and 78, Project 98, Grand Island; constructing I-beam bridge on William Street Rd., C. R. 338, Project 99, Lancaster; steel plate girder bridge over Eighteen Mile Creek, on Clarksburg-New Oregon Rd., C. R. 446, Project 100, Hamburg.

N. Y., Yorktown—Jan. 28, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, overcrossing at Crompond Rd., Bronx Parkway extension. J. Downer, Bronxville, ch. engr.; adv. E. N.-R. Jan. 22.

North Carolina—See "Contracts Awarded."

Pa., Pittsburgh—Jan. 27, by Bd. Comrs. Allegheny Co., Court House, disposing old bridge, erecting new steel concrete bridge at Flaugherty's Run, Moon Twp., $35,000. V. R. Covell, 519 Smithfield St., engr.

Ont., Ottawa—Mar. 1, by Secretary Bd. Control, Ottawa, steel plate girder bridge with concrete abutments and wing walls over Canadian National Ry. at Fairmont Ave. $40,000. A. J. Macalblum, city engr. Noted July 17.

CONTRACTS AWARDED

Iowa—State Hy. Comn., Ames, bridges, culverts in Dubuque Co., to H. O. Graham, Cedar Rapids, $1,850—F. A. B. 316 and 318, Hamilton Co., to Hirt & Loder, Woolstock, $4,800 and $12,121 respectively—Humboldt Co., to Snyder & Johnson, Humboldt, $11,985—Linn Co., to Lundgren-Reis Co., Des Moines, $60,100 — B-253, Marion Co., to E. M. Shoppe, Jefferson, $2,075—B-675, Marion Co., to G. Jordon, Centerville, $11,949. Grand total $104,880. Noted Dec. 25.

Iowa—State Hy. Comn., Ames, culverts, extensions in Audubon Co., to L. Peterson, Cedar Rapids, $1,790 — culverts, extensions, Cass Co. and bridges, culverts in Pottawattamie Co., to C. W. Akin, Atlantic $3,616 and $7,890 respectively—culverts, extensions, Floyd Co., to J. B. Elliott, Independence, $4,340—culvert, extension Mills Co., to Wilson Concrete Co., Red Oak, $1,100—culverts, extensions, B-713 and bridges, culverts, extensions F. A. P. 154, Carroll Co., to F. Russell & Son, Waukon, $1,090 and $31,410 respectively—bridges in Carroll Co., to Eno & Montgomery, Rockwell City, $13,900—Madison Co., to Brennen Bros., Lansing, $9,490—Madison Co., to Kelley & Overman, Villisca, $10,047 —Pottawattamie Co., to E. E. Spetman, Council Bluffs $7,148—Pottawattamie Co., to Forgie & Groth, Sioux Center $25,375 — Union Co., to Jensen Constr. Co., Kimballton, $26,900 — Webster Co., to C. J. Kramme Co., Ft. Dodge, $26,883—Adair Co., to W. E. Shoppe & Bro., Jefferson, $1,250 — Carroll Co., to A. Olson Constr. Co., Waterloo, $1,380. Grand total $173,609. Noted Dec. 4.

Ia., Waterloo—City, 758 ft. bridge, incl. four 51 ft. 6 in. steel truss spans, two 38 ft. rein.-con. girder approach spans on each end, 24 ft. roadway, two 5 ft. sidewalks, 18th St., to Olson Constr. Co., 618 Caward Bldg., $81,455. Est. $104,397. Noted Dec. 25.

Mich., Grand Rapids—Kent Co. Road Comn., Plaster Creek Bridge, one 75 ft. span, to have 2 reinforced counterfort abutments, steel deck girder, to Peninsular Constr. Co., Grand Rapids, $29,290.

North Carolina— State Hy. Comn., Raleigh, rein.-con. bridge, culverts in Craven Co., day labor. J. D. Waldrop, state hy. engr. Noted Nov. 27.

Ohio — R. N. Waid, dir. Hys., Columbus, widening existing concrete bridge, also new 60 ft. concrete bridge, 30 ft. roadway, over Beaver Creek, 6 culverts, paving approaches, Green Co., to Clark Bros. Co., Maysville, Ky., $32,407 — extending present 10 ft. spandrel filled arch bridge to 66 ft. between curbs, Hamilton Co., to Bigler Paving Co., Middletown, $9,719—four 90 ft. span plate girder bridge, approaches, two 3 ft. sidewalks, Lake Co., to Purdy Constr. Co., Mansfield, $71,801. Grand total $11',927. Noted Dec. 11.

O., Cleveland — Cuyahoga Co., Court Hquse, 18,000 ft. oak piling for Pier 9 of new Lorain Central Bridge, to Walsh Constr. Co., 2001 Scranton Rd., $27,000. Noted Dec. 25.

Pa., Butler—Bd. Comrs. Butler Co., 122 ft. steel, concrete girder bridge, 30 ft. roadway, 5½ ft. sidewalks over Connoquenessing Creek, Kittanning St., to C. Winters Constr. Co., Main St., $36,614. Est. $50,000. Noted Dec. 11.

Virginia—State Hy. Dpt., Richmond, 60 ft. steel truss span bridge with 24 ft. roadway over Great Creek, Brunswick Co., to C. M. Buchanan & Co., Clarksville, $9,648; 30 ft. rein.-con. beam span bridge over Totaro Creek, Brunswick Co., to Fredericksburg Bridge Co., Fredericksburg, $2,484. Noted Dec. 25.

Wash., Tacoma—Pierce Co., 1 span, 300 ft. steel, concrete bridge over Puyallup River, to Hart Constr. Co., 711 Middle Waterway, $57,300.

STREETS AND ROADS

BIDS ASKED

Arizona — Jan. 28, by State Hy. Comn., Phoenix, oil processing 15.5 mi. Florence-Tucson Hy., F. A. P. 94 F, Pima Co. W. W. Lane, state hy. engr.

Arizona—Jan. 29, by State Hy. Comn., Phoenix, grading, draining, placing sub-grade stabilizer, bridges on Tucson-Nogales Hy., F. A. P. 25-A, 25-B, 75, 86-B and 86-G. W. W. Lane, Phoenix, state engr.

Calif., Bell—Feb. 2, by City Council, grading, curbing, sidewalks, oiled macadam on disintegrated granite sub-base surfacing 298,000 sq. Mayflower Ave.

Calif., Riverside—Bd. Supervs. Riverside Co., taking bids grading, 50,000 cu.yd. Elsinore-Capistrano Hy. $40,000. A. C. Fulmer, Riverside, engr.

Calif., Santa Ana—Jan. 27, by Bd. Supervs. Orange Co., grading, shoulders, ditches, coarse on gravel surfacing 6,555 ft. Whitaker Ave.

Calif., Santa Ana—Feb. 4, by Bd. Directors Joint Hy. Dist. 15, clearing, grading 3.5 mi. Ortega Hy., Sect. F, also rein.-con. bridges Orange Co.

Calif., Santa Clara—Feb. 2, by A. J. Crossett, city clk., grading, curbing, guttering, asphaltic concrete paving on quarry waste base 80 blocks. To exceed $25,000.

Fla., Jacksonville — Feb. 4, by City Comn., curbing, widening with 9 ft. concrete parking areas, 1½ in. sheet asphalt on 1½ in. binder paving Lee St. from Bay to Forsyth Sts.—curbing, 1½ in. sheet asphalt on 1½ in. binder on 6 in. concrete paving Lee St. from Forsyth to Adams Sts.—concrete curbing, 6 in. concrete with bituminous mat paving Boulevard from 21st St. to Golfair Ave. — Stuart St. from Forsyth St. to Adams Sts.—concrete curbing, 6 in. concrete paving 17th St. from Main to Liberty Sts.—widening existing pavement with 5 ft. concrete parking areas, using and resetting existing granite curbing in Broad St. from Monroe to State Sts.

Illinois—Feb. 4, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete, bituminous filled brick, bituminous concrete (either fine or coarse aggregated type) on concrete surfacing 6.5 mi. Route 5, Sect. 7-Y—0.21 mi., Route 46, Sect. 464-H-1, all Cook Co.—1.42 mi. Route 6, Sect. L-Y Kane Co.—4.94 mi. Route 6, Sect. 2-Y, DuPage Co.—7.3 mi. Route 48, Sect. 114—8.1 mi. Route 48, Sect. 115, both Ford Co.—3.6 mi. Route 59, Sect. 113 Will and DuPage Counties—6.25 mi. Route 78, Sect. 125—8.25 mi. Route 78, Sect. 126—6.13 mi. Route 80, Sect. 118, all Henry Co.—3.74 mi. Route 78, Sect. 144 Mason and Cass Counties—6.27 mi. Route 78, Sect. 145, Cass Co.—5.4 mi. Route 120, Sect. 101 Mason and Logan Counties—4.45 mi. Route 120, Sect. 102—4.57 mi. Route 120, Sect. 103—7.88 mi. Route 121, Sect. 134, all Logan Co.—5.53 mi. Route 120, Sect. 114 Dewitt and Piatt Counties—4.52 mi. Route 122, Sect. 126 Tazewell Co.—3.71 mi. Route 160, Sect. 138—4.9 mi. Route 160, Sect. 139, both Bond Co.—grading 2.93 mi. Route 85, Sect. 102-A—1.9 mi. Route 85, Sect. 103-A—4.02 mi. Route 85, Sect. 104-A—all Mercer Co.—2.94 mi. Route 99, Sect. 105-A McDonough Co.—0.7 mi. Route 120, Sect. 101-A Mason and Logan Counties—1.38 mi. Route 120, Sect. 102-A—1.14 mi. Route 120, Sect. 103-A—both Logan Co.—5.6 mi. Route 120, Sect. 113-A DeWitt Co.—3.07 mi. Route 120, Sect. 115-A Piatt Co. F. T. Sheets, ch. hy. engr.

Ill., Fairview—E. F. Motsinger, engr., City Hall, bids about Mar. 1, grading, curbing, concrete, rein.-con. paving 2,600 ft. Fairview Paving Dist., 18 and 37 ft. $25,000.

Ind., Bloomfield — Feb. 3, by Bd. Comrs. Greene Co., macadam surfacing Ed. Ellis Rd. $26,420. H. Schloot, Bloomfield, engr.

Ind., Marion — Bd. Comrs. Grant Co. bids about Feb. 6, asphalt paving 1.5 mi. Hiersteand Rd. $35,000. W. Wilson, Marion, engr.

Ind., South Bend—Feb. 16, by Bd. Comrs. St. Joseph Co., improving Silver Rd., Liberty Twp. $20,800—Edison Rd., Warren Twp. $10,600—Grant Rd., Portage Twp., $23,400—Box Rd., Clay Twp. $15,200—Tamarack Rd., Lincoln and Liberty Twps., $19,600. E. R. Feldman, South Bend, engr.

Iowa—Jan. 26, by State Hy. Comn., Ames, grading, surfacing 3,482 sq.yd. Rd. 161, Project F-86-A and 7,268 sq.yd. Rd. 113, Project F-687, in Monticello—2,750 sq.yd. Rd. 161, Project F-86-B, in Anamosa, all in Jones Co. C. R. Jones, aud.

Ia., Monticello—Jan. 26, by R. Echternacht, city clk., grading, curbing, guttering, asphalt expansion joints, 7 in. concrete paving 14,691 sq.yd. Howard R. Green Co., 208-10 Bever Bldg., Cedar Rapids, engr.

Ia., Monticello—Jan. 26, by R. Echternacht, city clk., curbing, guttering, 7 in. rein.-con. paving 20,000 sq.yd. H. R. Green Co., 417 1st Ave. S. W., Cedar Rapids, engrs.

Louisiana—Feb. 10, by State Hy. Comn., Baton Rouge, amiesite 10 mi. Ferriday—Azucensa Hy., Tensas and Concordia Parishes—7 mi. Port Barre-Opelousas Hy., St. Landry Parish—8 mi. Chatham-Monroe Hy., Jackson and Ouachita Parishes—concrete surfacing 16.5 mi. Donaldsonville-Napoleonville Hy., Ascension and Assumption Parishes—11.4 mi. Oakdale-Glenmora, Allen and Rapides Parishes—11.2 mi. DeRidder-Ennes Hy., Beauregard Parish—12 mi. Homer-Minden Hy., Claiborne and Webster Parishes—

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Streets and Roads (Continued)

19 mi. Ferriday-Jonesville, Hy., Concordia Parish —15.6 mi. Grand Cane-Stonewall Hy., DeSoto Parish—9.6 mi. Baton Rouge-Clinton Hy., East Baton Rouge Parish—12.7 mi. Archibald-Winnesboro Hy., Franklin and Richland Parishes—18.5 mi. William-Alexandria Hy., Grant and Rapides Parishes—asphaltic surfacing 8 mi. Ferriday-Vidalia Hy., Concordia Parish—18 mi. Jonesboro-Chatham Hy., Jackson Parish—16.3 mi. Fluker-Clinton Hy., St. Helena Parish—24 mi. Simpson-Zimmerman Hy., Vernon and Rapides Parishes—15 mi. Chatham-Monroe Hy., Jackson and Ouahita Parishes—grading, drainage structures 26.3 mi. Gold Meadow-Grand Isle Hy., Lafaurche and Jefferson Parishes—2.8 mi. Bush-Sun Hy., St. Tammany Parish—grading, gravel, surfacing 3.8 mi. Rola-Haas Hy., Avoyelles Parish. W. H. Norckauer, hy. engr.

Louisiana—Feb. 10, by State Hy. Comn., Baton Rouge, concrete surfacing 9 mi. Gretna-Oakville Hy., Jefferson and Plaquemine Parishes —6 mi. Kelly-Grayson Hy., Caldwell Parish—10 mi. New Iberia-Erath Hy., Iberia Parish—13.2 mi. Quitman-Rushton Hy., Jackson and Lincoln Parishes—15.3 mi. Doyle Hammond Hy., Livingston and Tangipahoa Parishes—9.4 mi. Opelousas-Swords Hy., St. Landry Parish—10 mi. Mandeville-Slidell Hy., St. Tammany Parish—15.6 mi. Rosepine-Leesville Hy., Vernon Parish —19 mi. Franklinton-Bogalusa Hy., Washington Parish—15.1 mi. Plaquemine-Port Allen Hy., West Baton Rouge and Iberville Parishes—14 mi. Winnfield-Grand Ecore Hy., Winn Parish—11.8 mi. Packenham-St. Bernard Hy., St. Bernard Parish—amiesite surfacing 25.7 mi. Jena-Harrisonburg Hy., La Salle and Harrisonburg Parishes. W. H. Norckauer, hy. engr.

La., Monroe—Jan. 26, by City Council, curbing, guttering, sidewalks, sheet asphalt surfacing 3,375 sq.yd. M St. W. F. Neel, city engr.

Maryland—Jan. 27, by State Roads Comn., Baltimore, concrete paving 1.07 mi. hy., along Goldsboro-Del. Line Rd., Contr. Co.—63-22, F.A.P. 219-B Caroline Co.—1.15 mi. Contr. Q-69-24, F.A.P. 211-B, Queen Anne's Co.

Md., Baltimore — Jan. 28, by Bd. awards, sheet asphalt paving 9,600 sq.yd. streets in Contr. 573; concrete paving 8,700 lin.ft. streets listed in Contr. 574. N. L. Smith, hys. engr.

Minn., Waseca—Feb. 10, by City, J. Madigan, clk., paving 23,350 cu.yd. .$50,000.

New Mexico—Jan. 28, at office W. C. Davidson, state hy. engr., Santa Fe, grading, crushed rock surfacing 3.308 mi. F. A. P. 3, Reopened, from Santa Fe to Pecos, Santa Fe Co.— grading, crushed graveling 8.059 mi. F. A. P. 21-B, Alcalde-Embudo Rd., Rio Arriba Co.—4.33 mi. F. A. P. 1147-H, San Juan Co.—grading, crushed selected material paving 3.806 mi. F. A. P. 88-F, from Algodones to Santa Fe, Santa Fe Co.—11.458 mi. F. A. P. 168-B, from Logan to Nara Visa, Harding and Quay Counties —crushing, hauling, spreading top course surfacing 14.8 mi. F. A. P. 107-D, from Las Cruces to Hot Springs, Dona Ana and Sierra Counties—grading, bridging 4.331 mi. State Rd. 19, San Juan Co.

New York and New Jersey—Feb. 16, at office General Manager Port of New York Authority, 80-90 8th Ave., New York, constructing plaza section Port Richmond Approach to Kill von Kull Bridge, between Bayonne, N. J. and Port Richmond, N. Y.; adv. E. N.-R. Jan. 22.

N. Y., Babylon—Feb. 5, by Long Island State Park Comn., Belmont Lake State Park, grading, drainage Northern State Parkway, Sect. I, Nassau Co., and grade separation structures at crossing of Long Island Motor Parkway New Hyde Rd., Shelter Rock Rd., Searingtown Rd. and Mineola Ave. W. E. Andrews acting ch. engr.; adv. E. N.-R. Jan. 22.

N. Y., Brooklyn—Jan. 28, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, grading, curbing, flagging Glenwood Rd., Elmor Pl., Albany Ave., East 31st, East 91st, and Milford Sts.; grading, curbing, flagging, sheet asphalt on concrete paving New Lots Ave.

N. Y., Long Island City—Jan. 26, by G. U. Harvey, pres. Queens Boro, Queens, Subway Bldg., grading, curbing, sidewalks, 64th Lane, Stanhope, 32nd Aves., 91st, 153rd, 78th, and Winifred Sts., grading, sheet asphalt on concrete paving Fosdick and Ralph Aves.—grading, bituminous concrete on concrete paving 63rd (Hedwig) St.—grading, culverts on Linden Blvd.— grading, ramps, bulkheads, guard rails, temporary bridge in Elkhorn St.

Oklahoma—State Hy. Dpt., Oklahoma City, **(F.A.P. means Federal Aid Project and S.A.P. State Aid Project)** soon takes new bids furnishing, hauling, spreading 3,500 tons gravel on Warner Rd., U. S. Hy. 64, Muskogee Co. $25,-000—stone screening 18.2 mi. S. A. P. 674 near Atoka, Atoka Co. $30,000—gravel top surfacing 8.34 mi. Lenapah Rd., S. A. P. 1545 Nowata Co. $30,000—3.18 mi. Nowata Rd., S. A. P. 544, Nowata Co. $40,000 — grading drainage structures 14.41 mi. Hopeton Rd., F. A. P. 264-A Woods Co. $25,000. Former bids rejected. Grading, drainage structures 11.13 mi. Chattanooga Rd., S. A. P. 1623 Comanche Co. $30,-000. 13.41 mi. Mangum Rd., F. A. P. 278-A and B, Greer Co. $35,000, 8 mi. Waureka Rd., F. A. P. 218-A $25,000, 8 mi. same road, Sect. B, $25,000 and 8.28 mi. same road Sect. C $25,000, all Jefferson Co. were enjoined by court order.

Washington—Jan. 27, by S. J. Humes, dir. Hys., Olympia, grading 1.3 mi. State Rd. 12, Niawiakum River to Paliz River, F.A.P. 178-B, Pacific Co.; maintenance site, filling portion Lots 12 to 15 (inclusive) and all of Lots 16 to 18 (inclusive) of Block 272, Seattle Tide Lands, 6th Ave. S. and Spokane St., in Seattle.

West Virginia — Jan. 27, by State Roads Comn., Charleston, **(P. means Project)** retread surface on stone base surfacing 3.5 mi. Hico-Lookout Rd., P. 94 and 176-A — bituminous macadam on stone surfacing 6.7 mi. Camp Lookout Rd., P. 171-A—grading, drainage structures 0.3 mi. Gauley River Rd., P. 3358-B, all Fayette Co.—grading, draining, 4.75 mi. New Cumberland-Pughtown Rd., P-181-B—grading, draining, concrete surfacing 1.5 mi. Chester-Newell Rd., P. 3449, both Hancock Co.—grading, concrete surfacing 5.6 mi. New Martinsville-Proctor Rd., P. 184-B Wetzel Co.—45,000 lin.ft. wire guard rail, U. S. R. 60 Greenbrier Co.—130,000 lin.ft. S. R. 24, Pocahontas Co.—115,000 lin.ft. S. R. 21, Summers and Greenbrier Counties—57,000 lin.ft. S. R. 8, Mingo and Logan Counties, G. W. White, secy.

Wyoming — Jan. 27, by State Hy. Comn., Cheyenne, grading, graveling 5.839 mi. F. A. P. 143-A—4.897 mi. F. A. P. 143-B—6.85 mi. F. A. P. 86—11.674 mi. State Project 880, all foregoing on Buffalo-Sheridan Rd., Johnson and Sheridan Counties—11.654 mi. F. A. P. 201-A —10.157 mi. F. A. P. 48-A—7.155 mi. F. A. P. 48-B—6.21 mi. S. P. 881, all foregoing in Converse Co. — grading, trestles on 3.069 mi Guernsey-Dwyer Rd., Platte Co.—13.787 mi F. A. P. 190, Rock Springs-Green River Rd., Sweetwater Co.—grading for underpass, State Project 873, Kemmerer-Big Piney Rd., Lincoln Co.

Ont., Kitchener—Kitchener Suburban Roads Comm., L. Litchy, engr., County Bldg., bids early in March, concrete paving 1.5 mi. Williamsburg Rd. 40,000.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading, draining 13.7 mi. Globe-Safford Hy., F. A. P. 87-E, to R. E. McKee, 1918 Texas St., El Paso, Tex., $167,812; 2 bridges, widening fill, subsurfacing F. A. P. 55-Rec., Yuma-Phoenix Hy., to H. L. Royden, P. O. Box 865, Phoenix, $13,-572. Noted Jan. 1.

California — Imperial - San Diego Counties Joint Hy. Dist. 17, grading, overhauling, dykins headwall, corrugated culverts 25.41 mi. (1st unit) Julian-Kane Rd., to Butterfield Constr. Co., 5th and University Aves., San Diego, $42,495. Noted Dec. 25.

California — C. H. Purcell, engr. State Hy. Comn., Sacramento, grading, bituminous surfacing 3 mi. Harts Station Rd. E., to Lilly-Biasotti & Willard, Stockton, $18,696. Noted Dec. 18.

California — State Hy. Comn., Sacramento, C. H. Purcell, engr., clearing, grubbing right-of-way, drainage structures, grading 7.4 mi.

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Streets and Roads (Continued)

Washington Rd., Nevada Co., to **Frederickson & Watson** and Frederickson Bros., 354 Hobart St., Oakland, $92,012. Noted Dec. 11.

Calif., Long Beach—City Council, sidewalks, curbing, guttering, grading, 6 in. concrete paving 160,000 sq.ft. Santa Fe Ave. between Livingston Dr. and 7th St., to M. A. and P. R. Hughes, 414 Pine St., $32,840. Noted Dec. 18.

Calif., Los Angeles—Los Angeles Co., grading, curbing, sidewalks, 6 in. concrete paving Vineland Avenue and Calvert Street Impvt. Dist., to G. T. McLain, 2966 Allesandro St., $86,005.

Calif., Oakland — F. C. Merritt, city clk., grading, curbing, guttering sidewalks, concrete paving 106,000 sq.ft. Hampton Rd., Liggett Dr., etc., to Heafey-Moore Co., 344 High St., $32,305. Noted Dec. 25.

Calif., Riverside—City Council, G. A. Mills, clk., curbing, guttering, sidewalks, 6 in. concrete paving 250,000 sq.ft. La Cadena Dr., to W. A. McLeod, 185 Merrill Ave., $44,550. Noted Dec. 25.

Calif., San Bernardino — Curbing, sidewalks, 4 in. asphaltic concrete paving 150,000 sq.ft. Marshall Blvd. between Mountain View Ave. and Genevieve St., to Hall-Johnson Co., 905 Westminister St., Alhambra, $29,687.

Calif., San Diego—City Council, grading, curbing, guttering, sewers, 6 in. asphaltic concrete paving 14,188 sq.yd. 40th and Madison Sts., to Griffith Co., 2104 Main St., $24,154.

Idaho — C. J. Chaffins, dist. engr., Coeur d'Alene, crushed rock surfacing 1.663 mi. Benewah Co., to Scenic Better Roads Hy. Dist., St. Maries, $20,838. Noted Dec. 26 Daily.

Idaho—J. D. Wood, comr. P. Wks., Boise, grading, 7.66 mi. Old Oregon Trail, F. A. P. 144-A, to Bauers & Bauers, Dayton, Wash., concrete pipe $35,757. Noted Dec. 18.

Ind., Anderson—Bd. P. Wks., asphalt resurfacing 1 mi. 8th St., 60 ft. to Andrews Asphalt Paving Co., Hamilton, O., $27,386. Est. $30,000.

Ind., Boonville—Bd. Comrs. Warrick Co., bituminous on limestone surfacing 6 mi. Philip Hoffman Rd., to L. J. Utley & Son, Mt. Vernon, $53,156. Est. $64,000. Noted Dec. 25.

Ind., Jeffersonville—Clark Co., concrete surfacing C. E. Willey Rd., to Severin Bachman Co., Madison, $20,575. Est. $27,651. Noted Dec. 11.

Iowa—State Hy. Comn., Ames, to McDougall Constr. Co., Sioux City, gravel surfacing 1.9 mi. roads in Keokuk Co., $4,499; 9.651 mi. Lucas Co., $26,091; 15.76 mi. Ringgold Co., $44,987; 11.892 mi. Warren Co., $32,009; 7.788 mi. Taylor Co., $22,317 — to M. M. Beard, Knoxville, 0.73 mi. Marion Co., $1,470 — to Wilmott & Kurt, Bellevue, 419 cu.yd. riprap, F-303 Tama Co., $1,048; 378 cu.yd. F-257 Tama Co., $1,036—to G. Cronkhite, Perry, 130,530 lin.ft. guard rail in Dist. 5, $32,986; 170,900 lin.ft. guard rail Dist. 7, $82,325. Grand total $248,768. Noted Dec. 4.

Iowa—State Hy. Comn., Ames, to Anderson & Empie, Marshalltown, grading, flumes, paving 9.229 mi. F-315, $260,737; 4.662 mi. F-19 $130,492, both Grundy Co.—to W. O'Neil & Sons Co., Faribault, Minn., 9.493 mi. Union Co. $243,314 — to C. F. Lytle Constr. Co., 504 Nebraska St., Sioux City, 17.048 mi. F-155 $473,403; 7.171 mi. F-314 $185,923, both Cass Co.—to Bryant Paving Co., Waterloo, 16.203 mi. Grundy Co. $487,021—to Central Eng. Co., 809 Putnam Bldg., Davenport, 2.618 mi. P-578-G $65,237; 15.092 mi. F-324 $378,951, both Washington Co.; 0.305 mi. Johnson Co. $7,908—to Reed & Wheelock, Clay Center, 8.098 mi. F-325 $8,098; 5.023 mi. F-169 $149,788, both Madison Co.—to Union Constr. Co., 200 New York St., Des Moines, 16.454 mi. F-318 $463,139—6.842 mi. F-316 $201,245, both Hamilton Co.—to Nolan Bros., Minneapolis, Minn., 5.601 mi. Floyd Co. $162,926—to S. J. McLaughlin & Sons Co., 510 Insurance Exch. Bldg., Des Moines, 6.589 mi. Pottawattamie Co. $172,336—to Natl. Constr. Co., 305 Arthur Bldg., Omaha, Neb., 9.686 mi. Audubon Co. $266,814—to Des Moines Asphalt Paving Co., 2nd and New York Sts., Des Moines, 4.399 mi. Adair Co. $140,453; 11.795 mi. Madison Co. $382,540—to Amer. Paving Corp., 1324 Grace St., Omaha, Neb., 7.609 mi. Montgomery Co. $201,439—to Moran Constr. Co., Omaha, Neb., 14.485 mi. Shelby Co. $402,774—to Sargent & Roth, Keystone, grading 4.074 mi. Marion Co. $24,919—to F. C. Bretz, Ayrshire, 5.312 mi. Humboldt Co. $25,025—to Hartzell & Teepell, Early, gravel surfacing 3.191 Lyon Co., $2,675—to McDougall Constr. Co., Sioux City, 2.501 mi. Montgomery Co. $2,855—to A. Mulvenna, Hopkinton, 12.1 mi. Washington Co. $12,300. Grand total $4,852,312. Noted Nov. 20 and Dec. 25.

Kansas—State Hy. Comn., at Court House, Lawrence, grading, culverts 9.511 mi. roads in Douglas Co., to Reed & Wheelock, Clay Center, $110,078; 6.621 mi. Osage Co., to Rogers Constr. Co., Abilene, $35,604. Noted Dec. 11.

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Kan., Hays—City, H. W. Oshant, mayor, grading, curbing, guttering, sewers, 2½ in. brick, ½ in. sand cushion on 4 in. concrete surfacing 24,656 sq.yd., to H. J. Taylor Constr. Co., Salina, $85,205. Noted Jan. 1.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures 6.036 mi. Federal Aid Project 212-AG, Russell Co., to M. P. Smith Constr. Co., Somerset, $33,861. Noted Sept. 18.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures using 1st class rein.-con. pipe 9.5 mi. Hopkinsville-Lafayette Rd., Christian Co., to Gorrell, Barrow & Kirkpatrick, Russellville, $66,334; 15.6 mi. Owenton-Frankfort Rd., Owen Co., to Southeastern Constr. Co., Emminence, $149,549. Noted Nov. 13.

Louisiana—State Hy. Comn., Baton Rouge, concrete surfacing 14 mi. hy. in Allen Parish, to N. V. Duncan, Chicago, Ill., $334,591—10.8 mi. Morehouse and Ouachita Parishes, to Glassell-Cochran, Shreveport $187,640—10.4 mi. Tangipahoa Parish, to Lawrence Constr. Co., Jackson, Miss., $237,418—20.3 mi. West Baton Rouge and Point Coupee Parishes, to Forcum-James Co., Dyersburg, Tenn., $909,855—gravel or shell subgrade surfacing 16.3 mi. Ascension Parish, and grading, gravel or shell sub-grade surfacing 3.2 mi. Terrebone and Assumption Parishes, to Hoffman & Jones, Madisonville, $89,776 and $41,441 respectively—grading, gravel surfacing 10.6 mi. Allen and Beauregard Parishes, to Leathers & Martin, Alexandria, $51,662—3.2 mi. Vernon Parish, to J. H. Reeves, Many, $33,193—grading, local sand clay gravel surfacing 4.8 mi. Rapides Parish, to J. W. Gwin, Hamilton Station, Birmingham, Ala., $55,617—local iron ore gravel and crushed stone surfacing 7.9 mi. Sabine Parish, to Britt & Delanghter, Brighton, Ark., $26,374—grading, drainage structures 3.7 mi. Bienville Parish, to W. H. Williams, Arcadia, $9,948—11.4 mi. Caldwell and La Salle Parishes, to J. W. McKeithen, Grayson, $35,622—8.2 mi. Jackson and Winn Parishes, to J. C. Neal, Hermitage, Ark., $29,978—9.7 mi. Richland Parish, to R. N. Reynolds, Monroe, $15,998—8.3 mi. St. Charles Parish, to A. C. Campbell, Winfield, $59,720—2.6 mi. Terrebonne Parish, to McWilliams Dredging Co., Canal Bank Bldg., New Orleans, $61,436—dredged embankment with 40 ft. crown width, Lafourche Parish, to Huth Constr. Co., Inc., Franklin, $54,752. Grand total $2,235,022. Noted Dec. 18.

Md., Baltimore—Bd. Awards, sheet asphalt paving 6,470 sq.yd. streets listed in Contr. 568, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., $28,820. Noted Jan. 12 Daily.

Md., Baltimore—Bd. Awards, concrete base paving 12,000 sq.yd. streets listed in Contr. 567, to F. Bonadio, Old Town Natl. Bank Bldg., $20,345. Noted Dec. 25.

Michigan — E. D. Crandell, resident engr., Cadillac, grading, shaping, drainage, gravel surfacing 7.799 mi. FO83-13, Contr. 1, Wexford Co., to Maurer Bros., Nashville, for State Hy. Comn., Lansing, $26,357, incl. cement. Noted Dec. 18.

Mo., St. Louis—Bush-Burns Realty Co., 712 Chestnut St., grading, 300,000 cu.yd. in Westhampton Sub-division, at Hampton and Pernod Aves., to Fruin-Colnon Contg. Co., Merchants-Laclede Bldg.

Nebraska — Dpt. P. Wks., Lincoln, to Abel Constr. Co., 308 Terminal Bldg., Lincoln, grading 4.5 mi. Lancaster Co. $30,054; to Tri State Cement Products Co., Nebraska City, culverts, driveway pipe $8,243; to Wickham Bridge & Pipe Co., Council Bluffs, Ia., bridges $29,481—to Western Bridge & Constr. Co., 3967 Leavenworth St., 4 mi. graveling Antelope Co. $6,390—to A. L. Cramm & Co., Burwell, 4 mi. Holt Co. $4,166—to D. Quinton, Omaha, culverts Holt Co. $1,050—to Capitol Bridge Co., 1000 North 9th St., Lincoln, culvert pipe, Harlan Co. $1,064—to E. W. Nichols, Fairmont, culvert pipe, Logan Co. $488; to C. H. Bacus, Litchfield, culverts, culvert pipe $534. Grand total $81,470. Noted Dec. 18.

Neb., Alliance—Curbing, guttering, sewers, grading, sheet asphalt paving 40,000 sq.yd. Paving Dist. 4, tentatively awarded to Abel Constr. Co., Terminal Bldg., Lincoln, Neb., $132,543.

New York and New Jersey—General Manager Port of New York Authority, 80-90 8th Ave., New York, paving New Jersey approach to Hudson River Bridge between Fort Washington, N. Y. and Fort Lee N. J., to G. M. Brewster Co., Bogota, N. J., $469,467. Noted Dec. 11.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, asphalt paving Georgia Ave. to B. Turecamo Contg. Co., foot 24th Ave., $25,916—East 38th St., to M. J. O'Hara, Neptune Ave. and West 19th St., $6,193 — regulating East 27th St. and Lincoln Ave., to A. Suriano, 189 Minn St., $2,006 and $1,765 respectively—East 95th St. and Avenue L, to J. and M. Moran Excavating Co., 109 Decatur St., $1,224 and $753 respectively. Grand total $37,857. Noted Dec. 25.

N. Y., New York — Manhattan Boro, Municipal Bldg., granite block paving William St., to Walthaw Corp., 1860 Bway., $16,387. Noted Dec. 18.

N. Y., New York — Manhattan Boro, Municipal Bldg., granite block on [illegible] crete paving 9th Ave., to St. George Pa[illegible] Co., 415 Lexington Ave., $131,534. [illegible] Jan. 8.

N. Y., New York—H. Bruckner, pres. Bronx Boro., Crotona Park, 3rd and Tremont Aves., grading Commonwealth Ave., to LaRocco & [illegible] cella, 59 East 161st St., $2,814—Cheshire [illegible] St., to F. Gabriele, 2763 Reservoir Ave., $2[illegible] —regulating Wilder Ave., to C. Turiano, [illegible] East 238th St., $2,457; sewer in Throop Ave. to Anita Constr. Co., 410 200th St., $27[illegible] Grand total $35,026. Noted Jan. 1.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall grading, Arthur [illegible] Rd., to Vanbro Constr. Co., 24 Elizabeth [illegible] West New Brighton, $37,994—grading Outer bridge Crossing, to J. Johnson Sons, 455 Bway., $1,720—improving circular plot Ward Ave., and constructing relief drain in Jewett Ave., to Trifoglio Constr. Co., 105 Monroe Ave., Tompkinsville, $1,229 and $1,569 respectively—reconstructing culvert in Midland Ave., to J. J. O'Rourke, 238 Gordon St., $6,824; in Victory Blvd., to J. Fiorini, 135 St. Pauls Ave., $1,611. Grand total $50,947. Noted Jan. 1.

North Carolina—State Hy. Comn., Raleigh, grading, concrete and asphaltic concrete surfacing 4.52 mi. Wake Co. and 6 mi. Dare Co., to R. G. Lassiter & Co., Raleigh Banking & Trust Bldg., Raleigh, $64,980 and $158,502 respectively—grading, drainage structures concrete paving 5.59 mi. Martin Co., to Brown Paving Co., Lexington, $95,216—1.17 mi. Guilford Co., to Murray Constr. Co., 508 Union Ave., Knoxville, Tenn., $32,723—1.41 mi. Gaston Co., to G. R. Martin, Salisbury, $36,629 — grading, drainage structures, sand asphalt surfacing 11.75 mi. Columbus Co., to Newell Contg. Co., Martin Bldg., Birmingham, Ala., $165,797 — grading, drainage structures, crushed stone surfacing 4.45 mi. Watauga Co., to N. L. Teer, Durham, $62,237—concrete surfacing 9.88 mi. New Hanover Co., to Blythe Bros. Co., Charlotte, $121,407 — clearing, grubbing, grading, drainage structures 15.22 mi. Tyrrell Co., to Jamison Bros., Cotton States Bldg., Nashville, Tenn., $77,993 — clearing, grubbing, grading, rein.-con. structures 7.49 mi. Craven Co., to F. J. McGuire, Washington, $44,271. Grand total $859,755. Noted Nov. 27.

Ohio—R. N. Waid, dir. Hys., Columbus, concrete paving 0.407 mi. Sect. "Mayfield-Village" Salon-Willoughby Rd., and 0.88 mi. Sect. "Mayfield Heights" Salon-Willoughby Rd., Cuyahoga Co., to Cleveland Trinidad Paving Co., Western Reserve Bldg., Cleveland, $32,859 and $21,883 respectively—1.128 mi. Sect. "S" Cincinnati-Dayton Rd., Hamilton Co., to Bigler Paving Co., Middletown, $53,087—3.0594 mi. Sect. "N" Cincinnati-Dayton Rd., Hamilton Co., to Wilmore Paving Co., Middletown, $116,603 — slag surfacing 0.589 mi. Lake Co., to Purdy Constr. Co., Mansfield, $27,995—surface treated macadam surfacing 8.286 mi. Sect. "E" Toledo-Napoleon Rd. and 1.948 mi. Sect. "J" same road, Lucas Co., to N. B. Putnam, Columbus, $141,136 and $45,397 respectively. Grand total $438,960. Noted Dec. 11.

O., Akron—City, widening, asphalt paving Firestone Parkway from South Main St. to Wilbeth Rd., to Columbus Asphalt Paving Co., 311 South Silver St., $27,036. Est. $27,405.

O., Cleveland — Bd. Comrs. Cuyahoga Co., Court House, sidewalks on Brecksville Rd. from Rockside to Sprague Rd., to Cleveland Quarries Co., Builders Exch. Bldg., $46,149. Est. $50,093.

O., Hudson—Village, paving Atterbury Blvd., to McCourt Constr. Co., 365 South Main St., Akron, $57,109.

Okla., Muskogee—Grading, paving, 14 blocks Gibson St., 30 ft., to Gravelle & Hamblin, Barnes Bldg., $49,766. Est $55,000.

South Carolina — State Hy. Dpt., Columbia, grading, top-soiling 2.97 mi. road in Saluda and Newberry Counties, and clay macadam paving 4.44 mi. Oconee Co., to C. M. Lyle Constr. Co., Gainesville, Ga., $28,764 and $61,223 respectively—top-soiling 18.07 mi. Kershaw Co., to Smith & Bradfield, Macon, Ga., $168,656 — 13.45 mi. Clarendon and Williamsburg Counties, to Beckham-Lawler Constr. Co., Perry, Ga., $97,257. Grand total $355,900. Noted Nov. 27.

Okla., Oklahoma City—See "Airports."

Okla., Tulsa—City Comn., grading, paving 9 blocks 31st Pl., Bren-Rose and Zunis Sts., 30 ft., to J. H. Maxwell, 5 North Boston St., $23,669. Est. $26,000.

South Dakota—State Hy. Comn., Pierre, grading 15.224 mi. F.A.P. 51, Gregory Co., to Larson-Erling Co., Sioux Falls, $33,491. Noted Oct. 23.

Tex., Coleman—Brick on 6 in. caliche paving Galveston and Walnut Sts., to McCarthy & Allen, Coleman. Est. $25,000. Noted Dec. 2 Daily.

Utah—State Rd. Comn., Capitol Bldg., Salt Lake City, graveling, bridging Tooele Co., to Christensen & Gardner, Vermont Bldg., Salt Lake City, $35,934.

Wash., Port Orchard — Comrs. Kitsap Co., grading, graveling 5.3 mi. Manette-Brownsville Rd., to J. Otteson, Lyon Bldg., Seattle, $51,389 Noted Dec. 18.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Calif., Modesto — Modesto Irrigation Dist., digging wells, installing pumps, building spillways. $25,000.

Calif., Turlock—Turlock and Modesto Irrigation Dists., filed application with State Dpt. P. Wks., Div. Water Rights, 2 diversion dams, reservoir, power plant, conduit system, $3,575,000. R. V. Meikle, ch. engr. Turlock Irrigation Dist.

Calif., Victorville — Mojave Irrigation Dist. diversion and storage dams, canal system, incl. 10,000 ft. concrete lined tunnels, $1,500,000. **Maturity about October.** J. B. Lippincott, Petroleum Securities Bldg., Los Angeles, engr.

Ind., Kentland—Newton Co., Weiss and Kent Ditches. $27,500. J. Deardurff, Kentland, engr.

Ind., Logansport—Bd. Comrs. Cass Co., 5 mi. Beecher Ditch. $25,000. J. Chase, Logansport, engr.

Ind., South Bend—Bd. Comrs. St. Joseph Co., 11 mi. Potato Creek Drain. $50,000. E. R. Feldman, South Bend, engr.

Neb., Lexington—Dawson Co. D. D. 3, 800 acres drainage, incl. 100,000 cu.yd. excav. McNamara & Nosky, Dewey St., North Platte, engrs.

BIDS ASKED

Calif., Ventura—Feb. 3, by Bd. Comrs. Ventura Co., four 100 ft. protection jetties of railroad rails fabricated into forms of Tetrahedrons, incl. 28 tons used 60 lb. rails, 13 cu.yd. Class "B" concrete.

Ind., Fowler—Feb. 6, by Bd. Comrs. Benton Co., constructing Jacob-Leuck Drain, affecting 15,000 acre tract, $27,200; Big Pine Creek Ditch, 37,900 ft. long, $30,000. D. Whicker, Fowler, engr.

Ind., Marion—Feb. 6, by Bd. Comrs. Grant Co., Taylor Creek Ditch, incl. 6.5 mi. open constr., 0.5 mi. tile drain. $25,000. W. Wilson, Marion, engr.

La., New Orleans — Feb. 6, by Bd. Comrs. Orleans Levee Dist., 606 Common St., concrete retaining wall, auxiliaries along Lake Ponchtrain.

Maryland—Jan. 28, by State Roads Comn., Baltimore, concrete retaining wall, Contr. C1-95-511, Carroll Co. L. H. Steuart, secy.; adv. E. N.-R. Jan. 22.

Ont., Pelee Island—See "Contracts Awarded."

Ont., Windsor—Essex Border Utilities Comn., Canada Bldg., bids about Jan. 24, widening, deepening Grand Marais Drain, $90,000, and constructing 5 small bridges. $25,000. J. C. Keith, ch. engr. Noted Sept. 11.

CONTRACTS AWARDED

Calif., Turlock—A. Sorensen, secy., Turlock Irrigation Dist., 2 in. canal lining, Schedules 6 and 7, to H. Johanson, Turlock, $2,732 and $11,877 respectively; Schedule 8, to L. Terrell, Turlock, $4,954. Grand total $19,563. Noted Dec. 11.

N. Y., Glens Falls—R. D. Hayes, comr. Canals & Waterways, Dpt. P. Wks., State Office Bldg., Albany, repairing Glens Falls feeder, to E. J. Anderson, Glens Falls, $28,064. Noted Dec. 18.

Okla., Spiro—State Hy. Dpt., Oklahoma City, bank protection work along U. S. Hy. 270, near here, to List Constr. Co., Railway Exch. Bldg., Kansas City, Mo., $102,600. Est. $125,000.

Ontario—Secretary Dpt. Rys. & Canals, Ottawa, deepening Grenville Canal, to Farley & Grant, Bank Natl. Bldg., Rideau St., Ottawa, $26,000.

Ont., Pelee Island—Twp. Council, W. Stewart, clk., stone, concrete cribs to protect island from overow of lake, day labor. $35,000. O. Roelfson, c/o owner, engr. Noted Nov. 27.

Ont., Sudbury—City Council, removing 9,000 cu.yd. rock at Kelly Lake, to McGregor & Cherico, Sudbury, at $3.50 per cu.yd. Est. $30,000.

Public Bond Elections

Coming Bond Elections

Sewer—Calif., San Mateo. $50,000.

Bridge—Tex., New Braunfels, Feb. 10, $35,000.

Natural Gas System — Okla., Erick, Feb. 17, $50,000.

Schools—Calif., Salinas. $154,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Sells—SANATORIUM—U. S. Indian Bureau, Wash., D. C., sanatorium on Papago Indian Reservation. $128,000. P. D. Mossman, dir. Bureau Indian Affairs.

Ariz., Tucson—HANGAR—Con. Q. M. hangar.

Ark., Camp Pike (mail Little Rock)—AUDITORIUM, etc.— Camp Pike Honorary Comn. auditorium, swimming pool.

Ark., Hot Springs — HOSPITAL — Vet. Bu., Arlington Bldg., General Army Hospital group brick, concrete, steel, stone.

Ark., Little Rock — ADDITION — Vet. Bu., Arlington Bldg., preliminary plans rein.-con. brick clinical and reception building additions, for U. S. Veterans Hospital, at Fort Root.

Ga., Atlanta—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by A. Ten Eyck Brown, Forsythe Bldg., U. S. Post Office, Spring St.

Idaho, Filer—FISH HATCHERY—U. S. Bureau Fisheries, J. R. Russell, supt. for North West States, Smith Tower Bldg., Seattle, Wash., concrete ponds, accessories, at Thousand Springs Ranch.

Nev., Fallon — POWER PLANT — Bureau Reclamation, Denver, Colo., power plant at Lahontan Dam, Newlands Reclamation Project.

Tenn., Memphis—REVETMENT—U. S. Eng. revetment work in Happy Valley in Bend Island 12, Mississippi River and in Memphis harbor.

Tex., Fort Sam Houston—COMPANY BARRACKS—Con. Q. M., 3 story, 140 x 190 ft., rein.-con., tile company barracks, plain found.

Tex., Lubbock—POST OFFICE—Treas. Dpt., at office Sup. Archt., bids in March, U. S. Post Office. Noted Dec. 25.

BIDS ASKED

D. C., Wash.—ROAD—Feb. 25, by U. S. Dpt. Agriculture, Pub. Rds., constructing Unit 4, Mount Vernon Memorial Hy. from Columbia Island in Potomac River to gates of Mount Vernon, partly in District of Columbia and partly in Alexandria, Va.; adv. E. N.-R. Jan. 22.

Florida—TRAINING WALLS—Feb. 18, by U. S. Eng. Office, Jacksonville, repairing 8 mi. training walls and revetments, St. Johns River between entrance and Dames Point, adv. E. N.-R. Jan. 22.

Fla., Kissimmee—POST OFFICE—Feb. 17, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. Jan. 22.

Ind., Muncie — POST OFFICE — Feb. 2, by Treas. Dpt. at office Sup. Archt., remodeling U. S. Post Office. Noted Jan. 8.

Ia., Oelwein—POST OFFICE—Feb. 5 by Treas. Dpt. at office Sup. Archt. U. S. Post Office.

Ky., Louisville—STEEL PONTOONS, etc.—Feb. 5, by U. S. Eng. Office, P. O. Box 72, 33 steel pontoons 40 sections steel pipe and 25 pressed steel flanges; adv. E. N.-R. Jan. 22.

La., New Orleans — BARGES — Feb. 12, by U. S. Eng. Office, 1st New Orleans Dist., Poland and Dauphine Sts., one 60 x 22 x 4 ft. steel work barge; adv. E. N.-R. Jan. 22.

Minn., Minneapolis — LOCK — Jan. 28, by U. S. Eng., St. Paul, 2nd lock at Twin City Lock Dam, Mississippi River.

Mo., St. Louis—DREDGE PONTOONS—Jan. 28, by U. S. Eng., Custom House, 22 steel dredge pontoons.

N. J., Manasquan — JETTIES — Feb. 3, by U. S. Eng., 39 Whitehall St., New York, extending 2 jetties at Manasquan Inlet; adv. E. N.-R. Jan. 22.

N. C., Belhaven—DREDGING—Feb. 2, by U. S. Eng., Wilmington, 238,000 cu.yd. sand, mud, etc., in Belhaven Harbor; adv. E. N.-R. Jan. 22.

R. I., West Warwick—POST OFFICE—Feb. 11, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, Main and Charles Sts. Noted Nov. 27.

Tenn., Memphis—STEEL HULL—Feb. 3, by U. S. Eng., steel hull, pumping machinery for U. S. Dredge Henry Flad; adv. E. N.-R. Jan. 22.

Tex., Fort Sam Houston (mail San Antonio)—BARRACKS—Feb. 16, at office Con. Q. M., constructing and completing one motor repair barracks, utilities at Camp Normoyle; adv. E. N.-R. Jan. 22.

Tex., Fort Sam Houston (mail San Antonio)—QUARTERS—Feb. 16, at office Con. Q. M., constructing, completing 16 company officers quarters incl. utilities; adv. E. N.-R. Jan. 22. Noted Jan. 9.

Tex., Waco—HOSPITAL—Feb. 21, by Vet. Bu., Arlington Bldg., buildings and utilities at U. S. Veteran's Hospital. Noted Jan. 8.

Va., Langley Field — SEWAGE DISPOSAL PLANT — Feb. 17, at office Con. Q. M., Fort Monroe, sewage disposal plant, Heavier-Than-Air Sect., Langley Field; adv. E. N.-R. Jan. 22.

CONTRACTS AWARDED

Arizona—ROAD—Pub. Rds., 508 Ellis Bldg., Phoenix, grading, bridge on Springerville Rd., Apache Natl. Forest, to Skousen Bros., El Paso, Tex., $23,823.

Arkansas—LEVEE—U. S. Eng., Vicksburg, Miss., 400,000 cu.yd. earthwork in Kimbrough New Levee, south bank, Arkansas River, to W. E. Callahan Constr. Co., Arcade Bldg., St. Louis, Mo., $99,000. 400,000 cu.yd. in same levee, to Noble & Crow, Memphis, Tenn., $97,880. Noted Jan. 1.

Calif., Long Beach—DREDGING—U. S. Eng., Los Angeles, 774,000 cu.yd. in Long Beach Harbor and Cerritos Channel turning basin, to Standard Dredging Co., Central Bldg., Los Angeles, $0.1695 per cu.yd. Noted Jan. 22.

Calif., Los Angeles—DREDGING—U. S. Eng., 1,400,000 cu.yd. in East Basin Channel, Los Angeles Harbor and in Cerritos Channel to connect with work in Long Beach Harbor, to San Francisco Bridge Co., Nevada Bank Bldg., San Francisco, at $0.1825 per cu.yd.

Calif., San Diego—DREDGING—U. S. Eng., 825,000 cu.yd. in San Diego Harbor, to Western Dredging Co., Security Title Bldg., Los Angeles, $297,000.

Ill., Chicago—DREDGING—U. S. Eng., in north branch Chicago River, also deepening part Calumet River and turning basin to Great Lakes Dredge & Docks Co., 104 South Michigan Blvd., $67,200 and $196,400 respectively. Noted Sept. 4.

Ill., Pekin—EXTENDING, etc.—Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office, to J. McHug, Inc., 840 West 70th St., Chicago, $46,931. Noted Nov. 27.

La., New Orleans — LEVEES — U. S. Eng., Prytania and River Front, 167,000 cu.yd. earthwork in Pontchartrain Levee Dist., 2nd New Orleans Dist., to Highway Constr. Co., Inc., Godchaux Bldg., $20,708. Item 8a, 140,000 cu.yd. in Plaquemine Point Levee, to Grasser Contg. Co., Amer. Bank Bldg., $23,282; Item 5b, 350,000 cu.yd. Lower Morganza Levee, to M. W. O'Meara, 308 W. C. U., Quincy, Ill., $79,450; Item 6a, 250,000 cu.yd., to Canal Constr. Co., McCall Bldg., Memphis, Tenn., $58,750; Item 5a, 350,000 cu.yd. and Item 5c, 340,000 cu.yd. in Lower Morganza Levee, Atchafalaya Front Levee Dist., bids rejected, owner builds, $89,775 and $89,624 respectively. Grand total, $361,589. Noted Jan. 5, Daily.

Mass., Salem—DREDGING—U. S. Eng., Custom House, Boston, 74,100 cu.yd. Salem Harbor, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, at $0.46 per cu.yd. Noted Jan. 1.

Mississippi—EARTHWORK—U. S. Eng., Box 667, Vicksburg, 240,000 cu.yd. enlargement in Greenville Levee, to Morrow & Gary, Vicksburg, at $0.2289 per cu.yd. Noted Jan. 1.

Nev., Boulder City—TANKS—U. S. Reclamation Serv., Denver, Colo., 100 ft. diam. steel tank, 34 ft. high and 40 ft. diam. steel tank, 25 ft. high, to Pittsburgh-Des Moines Steel Co., 438 East 3rd St., Los Angeles, Calif., $28,700 and $24,351 respectively.

New Jersey — DREDGING — U. S. Eng., 39 Whitehall St., New York, 46,729 cu.yd. overlying material and 58,666 cu.yd. ledge rock, in Passaic River, to Dunbar & Sullivan, 2313 Buhl Bldg., Detroit, Mich., at $2.22 per cu.yd. Noted Dec. 18.

Oregon—ROAD—U. S. Eng., grading 4.285 mi. road in Siuslaw Forest, Douglas and Lane Counties, to F. H. Slate, Portland, $146,874.

T. H., Honolulu—DREDGING—U. S. Eng., dredging in reserved channel, Honolulu, to Hawaiian Dredging Co., Honolulu, $635,894. Noted Oct. 16.

FEDERAL POWER COMMISSION

Applications for License and Permits
Licenses

1139—Southern California Edison Co. Ltd., 306 West 3rd St., Los Angeles, Calif., wants license constructed transmission line on public land in Kern Co.

1140 — Salmon River Power & Light Co., Boise, Idaho, wants license constructed transmission line on public land in Lemhi Co.

1141 — E. O. Blakenship, Stehekin, Wash., wants license power project on Purple Creek partly within Chelan Natl. Forest, Chelan Co.

1142—California Oregon Power Co., 58 Sutter St., San Francisco, Calif., wants license constructed transmission line on Klamath Indian Reservation in Klamath Co., Ore.

1143—City of Idaho Falls, Idaho, wants preliminary permit power project on North Fork of Snake River, within Targhee Natl. Forest, in Fremont, Madison, Jefferson and Bonneville Counties.

1144—S. M. Graff, Seward, Alaska, wants license power project partly on public land in Lowell Creek within 3rd Judicial Dist., Alaska.

RAILWAYS

PROPOSED WORK

Colorado and Utah—Denver & Rio Grande Western R. R. Co., Equitable Bldg., Denver, Colo., A. O. Ridgeway, ch. engr., expending $1,500,000 incl. $300,000 for bridges, 50,000 grade

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Railways (Continued)

crossings, $70,000 automatic block signals, $118,000 yard trackage, $50,000 public improvements and paving.

Texas—Burlington-Rock Island R.R. Co., J. A. Hulen, pres. and purch. agt., Houston, rehabilitating terminal properties, incl. brick, stone depot, laying track in yards, at Galveston. W. S. Broome, c/o owner engr.

Texas—Chicago, Burlington & Quincy R.R., A. W. Newton, ch. engr., Polk and Dearborn Sts., Chicago, Ill., and Fort Worth and Denver Northern Ry. Co. (subsidiary), Denver, Colo., bids latter part month, extending railroad from Childress to Pampa. $800,000. Noted June 27, 1929.

BIDS ASKED

Michigan—Jan. 27, by Dpt. Water Supply, 735 Randolph St., Detroit, D. C. Grobbel, acting secy., railroad track for power plant at Springwells Station, incl. clearing, preparing right-of-way, constructing track subgrade, ballast tracks, cross overs, switches, switch stands, crossings, derails, appurtenances for complete system of trackage connecting with Detroit Terminal R.R. in Detroit. $30,000. G. H. Fenkell, genl. mgr.

New York—Feb. 10, by Dpt. Correction, State Office Bldg., Albany, new trestle and spur track at Attica State Prison, Attica, W. N. Thayer, Jr., comr.; adv. E. N.-R. Jan. 22.

CONTRACTS AWARDED

Kansas—Missouri-Pacific R. R. Co., Missouri-Pacific Bldg., St. Louis, Mo., E. A. Hadley, ch. engr., 30 mi. track between Gypsum City and Council Grove, to List Constr. Co., 413 Railway Exch. Bldg., Kansas City, Mo.

Ontario—Canadian Natl. Rys., C. S. Gzowski, ch. engr. constr. Montreal, Que., 5.8 mi. cutoff near Brantford, to R. C. Huffman Constr. Co., 331 Bay St., Toronto. Est. $250,000.

SUBWAYS AND TUNNELS

PROPOSED WORK

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., soon takes bids 4 track subway under and along 6th Ave., from 3rd to 53rd Sts. $40,000,000.

CONTRACTS AWARDED

Ont., Walkerville — City Council, subway under Pere Marquette Ry. tracks, Wyandotte St., to Gosselin Constr. Co., Windsor, $139,000; steel, to Canadian Bridge Co., Walkerville, $17,000. Noted Sept. 18.

GRADE CROSSINGS

PROPOSED WORK

Calif., Santa Cruz—Santa Cruz Co., bridge over Southern Pacific R.R. near Felton Station, in connection with relocating county hy. in that district. $35,000. L. Bowman, Santa Cruz, co. surv.

Colorado and Utah—See "Railways."

Colo., Pueblo—State Hy. Dpt., Denver, C. D. Vail, engr. and Atchison, Topeka & Santa Fe R.R. Co., W. W. Kelly, ch. engr. (Western Lines) Amarillo, Tex., concrete, steel underpass on Pueblo-Canon City Hy., near here. $100,000.

Ind., Decatur — City overhead crossing at Wabash R.R. and North Main St. $145,000.

Ind., Huntington—Erie R.R. Co., 50 Church St. and 71 West 23rd St., New York, G. S. Fanning, ch. engr., subway and 4 lane hy. $125,000.

Tex., Waco—Missouri, Kansas City & Texas R.R. Co., F. Ringer, ch. engr., St. Louis, Mo., and St. Louis Southwestern Ry. Co., W. S. Hanley, ch. engr., Tyler, preliminary plans underpass or viaduct. $350,000.

BIDS ASKED

N. Y., Buffalo — Jan. 30, by G. S. Minnis, engr., 1036 Ellicott Sq., grading, drains, sidewalks, asphalt paving 18,600 sq.yd. approach work in connection with Amherst, Austin and Tonawanda St. grade crossing eliminations, for City of Buffalo.

CONTRACTS AWARDED

Nebraska — Dpt. P. Wks., Lincoln, overhead crossing over Union Pacific R.R., Platte Co., to Woods Bros., Lincoln, $151,109; culverts to Parsons Constr. Co., West Dodge St., $6,824; structural steel, to Paxton & Vierling Iron Wks., 17th and Union Pacific R.R. tracks, Omaha, $40,037; electrical installation, to Yoho Electric Co., 240 North 9th St., Lincoln, $2,343. Grand total $200,313. Noted Dec. 18 under "Streets and Roads."

N. Y., Kanona—Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., 400 ft. rein.-con. grade crossing elimination, 30 ft. roadway, to E. P. Muntz & Co., Lehigh Valley Terminal Bldg., Buffalo, $65,000.

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N. Y., Portage—Erie R. R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating King Crossing, on Nunda-Portageville Hy., Livingston Co., to Newhall Co., 2548 Bway. Ave., Cleveland, O., $56,337. Est. $83,400. Noted Oct. 24, 1929.

DAMS

PROPOSED WORK

Calif., Turlock—See "Excavation, Drainage, Irrigation, Levees and Harbors."

Calif., Victorville—See "Excavation, Drainage, Irrigation, Levees and Harbors."

Pa., Waynesburg—See "Waterworks."

Ont., Thessalon—See "Waterworks."

BIDS ASKED

Tex., Marble Falls—See "Power Plants."

AIRPORTS

PROPOSED WORK

Ill., Decatur — City Comn. soliciting funds finance engineering surveys for airport. A. Mueller, Decatur, chn.

Ill., Peoria—City Park Bd., City Hall, M. G. Newman, pres., acquisition, erecting, maintaining airport.

BIDS ASKED

Mass., Norwood-Dedham-Canton — C. Kenniston, surfacing engr., 14 Meadow St., Norwood, taking bids grading and preparation of airplane runways, Fisher Meadows, off Neponset St., for Mass. Air Terminal & Arena.

CONTRACTS AWARDED

Okla., Oklahoma City—City Comn., grading at municipal airport,, to Blackburn Constr. Co., Colcord Bldg., $54,469. Est. $60,000.

Pa., Phila.—Dpt. P. Wks., City Hall Annex, A. Murdock, dir., clearing site at Hog Island, incl. removing all wood, metal, shipways, concrete, also leveling ground, erecting airport beacon, to B. M. Weiss, Widener Bldg., $269,500.

GRAIN ELEVATORS

PROPOSED WORK

Okla., Kingfisher—GRAIN TANKS—White Flour Mills, J. P. Burrus, pres., preliminary plans additional grain storage tanks. $50,000. Private plans.

POWER AND LIGHTING

PROPOSED WORK

Colorado—Southern Colorado Power Co., c/o W. N. Clark, genl. mgr., Colorado Bldg., West 4th and North Main Sts., Pueblo, appropriated $275,000, improvements in Pueblo, Fowler, Rocky Ford, La Junta, Ordway and Sugar City.

Ill., Peoria—Central Illinois Light Co., 320 South Jefferson St., Peoria, 27 mi. gas pipe line to serve Hanna City, Farmington, Yates City and Elmwood. $500,000.

Ill., Springfield—Illinois Power & Light Co., new and larger heating mains in 7th St. $184,000. **Maturity during this year.** A. D. Mackie, genl. mgr.

Tex., El Paso—El Paso Electric Co., Martin Bldg., improving electric and power plant, incl. dynamo unit, equipment, machinery, $150,000. Private plans.

Ont., Brampton—United Suburban Gas Co., 15 Main St. E., Hamilton, granted franchise gas system, distribution mains. $200,000. Private plans.

Ont., Hamilton—Dominion Natural Gas Co., 939 King St. E., extending gas mains, system. $250,000 up. Private plans.

BIDS ASKED

Illinois—See "Contracts Awarded."

N. Y., Pine Aire Station—Feb. 11, by Dpt. Mental Hygiene, State Office Bldg., Albany, ornamental lighting fixtures, at Pilgrim State Hospital, Suffolk Co. L. M. Farrington, secy.; adv. E. N.-R. Jan. 22.

CONTRACTS AWARDED

Calif., San Francisco—City, 300 concrete electrolier standards for Boulevard System, to Ne-Page-McKenny Co., 7 Front St., at $66 each; 600 metal standards, to Taper Tube Pole Co., Monadnock Bldg., at $85 each.

Illinois—Central Illinois Light Co., 316 South Jefferson St., Peoria, R. S. Wallace, genl. mgr., 50 mi. 4 in. steel gas transmission line from Peoria to Cuba, Farmington, Yates City and Elmwood, day labor. $90,000. Pipe purchased.

Mass., Boston — City, Traffic Comn., 154 Berkley St., automatic traffic control signal system, Unit 2, to American Gas Accumulator Co., Newark Ave., Elizabeth, N. J., $31,985. Former contract rescinded. Noted Dec. 4 under "Contracts Awarded."

Mich., Detroit—Public Lighting Comn., E. Atwater St., furnishing 1,000 combination street railway and lighting type standards with fabricated steel base, base and shaft cadmium plated to General Electric Supply Corp., 415 East Congress St., at $148.14 each, total $148,160.

Washington — Twin Harbors Electric Co., Aberdeen, 30 mi. 22 kv. transmission line from Finch Farms where it will connect with 13 kv. feeder from Grays Harbor company's system to give service to Westhaven, Westport, Cohasset, Grayland, Ocosta and Markham, and to Cranberry Dist., to H. C. Moss Constr. Co., Mehlhorn Bldg., Seattle.

SPORTS AND PARKS

PROPOSED WORK

Calif., Los Angeles—Los Angeles City School Dist., rein.-con. swimming pool, bleachers at Los Angeles High School site. $80,000.

La., Gretna—Swimming Pool Assn., A. Samuel, pres., 620 1st St., 50x150 ft. swimming pool $25,000. T. L. Perrier, Maritime Bldg., New Orleans, archt.

Mass., Boston—City, Park Dpt., 33 Beacon St., altering and constructing locker addition at Sullivan Sq. Playground, Charlestown, $25,000 or more. J. J. Murphy, Park Dpt., 33 Beacon St., engr.

Mass., Boston—City, Park Dpt., 33 Beacon St., sketches by J. M. Gray, 175 High St., 1 story, brick, concrete locker, Billings Field, West Roxbury. $25,000.

Mass., Dorchester (br. Boston)—City of Boston, c/o Park Dpt., 33 Beacon St., Boston, W. P. Long, chn., playground, Ashmont and Washington Sts. $25,000-$30,000.

Mass., Quincy—City, T. J. McGrath, mayor, enclosed athletic field, Northern Artery. $100,000. Engineer not selected.

N. J., Jersey City — International Stadium Co., C. Ferrar, pres., Plaza Hotel, preliminary plans rein.-con. stadium between State Hy., Bway., Dales and Logan Aves. $2,000,000. F. W. Milbor, 25 West 45th St., New York, archt. and engr. Noted Jan. 15.

N. J., Ocean City—Bd. City Comrs., City Hall, city park, incl. grading, sodding, concrete walks, 6th and Atlantic Ave. $50,000. W. H. Collitson, city engr.

Okla., Stillwater—Oklahoma Agricultural & Mechanical College new stadium. $500,000. Private plans. H. G. Bennett, pres.

BIDS ASKED

Mass., Boston—Jan. 27, by Park Dpt., 33 Beacon St., 1 story, concrete, brick bath house, laundry, locker, North End Park. $125,000. O'Connell & Shaw, 134 Newberry St., archts.

N. Y., New York—Jan. 27, by Park Bd., W. R. Herrick, pres. Park Dpt. Arsenal Bldg., Central Park, erection and completion field office in connection with West Side and Riverside Park Improvement, at Riverside Dr., near 80th St.; picket fences, with double gate, around wading pool and at entrances to Willet St., Hamilton Fish Park; 5 ft. galvanized chain link fences, along east drive Central Park between 85th and 97th Sts.

N. Y., Piermont—Lucht & Anderson, archts., 432 Palisade Ave., Cliffside, taking bids general contract 2 story, basement bath houses, pavilion, 70 x 180 ft. swimming pool, for H. and H. Corp., c/o architects. $150,000. Noted Dec. 11.

CONTRACTS AWARDED

Mass., Andover—Phillips Andover Academy, J. H. Buttimer, supt. buildings, 1 story, log cabin type recreation unit, off Highland St., to E. W. Pitman Co., Bay State Bldg., Lawrence. Est. $25,000.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Attica—Feb. 10, by Dpt. Correction, State Office Bldg., Albany, heating, sanitary work, kitchen equipment and bakery oven, machinery in Dining-Kitchen and Bakery Building, Attica State Prison; adv. E. N.-R. Jan. 22.

O., Cleveland—Feb. 2, by Bd. Educ., F. G. Hogan, dir., steam heating, boilers, settings, temperature regulator for James Ford Rhodes School. $95,000. G. M. Hopkinson, Auditorium Garage Bldg., archt.

UNCLASSIFIED

PROPOSED WORK

Calif., Ukiah—GAS TANKS—F. L. Bosworth, city clk., rejected bids Jan. 7, two 5,000 cu.ft. riveted gas tanks, 6 ft. diam., 30 ft. long, 3.8 in. shell, ⅝ in. heads, equipped with 11 x 15 in. manhole in head, three 2 in. forged steel flanges, one 4½ in. dial pressure gage, designed for 90 lb. per sq.in. working pressure, built in accordance with A.S.M.E. Code for Unfired Pressure Vessels. Will readvertise. Noted Jan. 1.

Unclassified (Continued)

Ia., Davenport—CEMETERY — Davenport Memorial Park, W. Davidson, secy., preliminary plans developing 15 acre tract in burial park, incl. landscaping, hard surfacing roads, walks, lagoon, underground sprinkling system, concrete, stone chapel with chimes tower at entrance. $150,000.

Massachusetts and Rhode Island—PIPE LINE—Standard Oil Company of New York, 31 St. James Ave., Boston, Mass., c/o Magnolia Pipe Line Co., W. H. Sniffin, assistant mgr., in charge project, 6 in. steel pipe line from East Providence, R. I., to Douglas, Mass., branching two ways to Worcester and Springfield, Mass. $1,000,000. Private plans.

Mo., St. Louis—EXCHANGE—Southwestern Bell Telephone Co., Telephone Bldg., 11th and Pine Sts., sketches by I. R. Timlin, 1916 Telephone Bldg., 2 story, basement, 100 x 130 ft., rein.-con., brick building to house Forest Delmar Exchange, Delmar Blvd. and Clarendon Ave.

N. Y., Brooklyn—COAL POCKETS—Schnabel Coal Co., Warehouse Ave. and East 24th St., sketches coal pockets. $40,000. O. J. Sambach, 51 Chambers St., New York, archt.

N. Y., New York—PIPE TUNNELS—Hunter College and Bd. Higher Education, City of New York, 736 Riverside Dr., pipe tunnels, passage ways. $150,000. Thompson, Holmes & Converse, 101 Park Ave., archts.

Oklahoma—NATURAL GAS SYSTEM—Agricola Gas Co., Dill, L. B. Clayton, pres., 10 mi. 4 in. steel pipe line from Canute to Foss, distribution system in Foss, $25,000; 9 mi. 4 in. steel line from point near Dill to Canute, distribution system in Canute, $25,000. L. B. Clayton, Dill, engr.

Tex., Ore City—MINE DEVELOPMENT—J. R. Flannery, Flannery Bldg., Pittsburgh, Pa., and J. T. Pierson, Ore City, preliminary plans developing 250,000 acres for mining iron ore, installing oil field equipment for drilling and short run lines, in Upshur, Morris, Marion and Harrison Counties.

Tex., San Antonio—GAS LINE—San Antonio Pub. Serv. Co., North St. Mary's St., natural gas pipe lines in outlying districts, extensions, replacements, c.i. pipe welded and crew joints, $200,000. Private plans.

Tex., Tahoka — POTASH and SILICA DEPOSIT DEVELOPMENT—Uel Stephens & Associates, Moore Bldg., purchased 11,000-acre tract, near here, and plan developing potash deposits. Complete machinery and equipment to be installed. Noted Dec. 25.

BIDS ASKED

N. Y., Wingdale—REFRIGERATION—Feb. 11, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work in reception building, Harlem Valley State Hospital; adv. E. N.-R. Jan. 22.

Tennessee—CONCRETE SPILLWAY—Jan. 30, by State Dpt. Hys. & P. Wks., Nashville, 330 ft. concrete spillway at Reelfoot Lake, State Hy. 21, Federal Aid Project 71, Obion Co. R. H. Baker, hy. comr.

CONTRACTS AWARDED

Calif., Compton — MAUSOLEUM — Angelus Abbey Mausoleum, East Main St., Los Angeles, general contract rein.-con. mausoleum, incl. 4,000 crypts, to Beswick Constr. Co., 230 Newport St., Long Beach, $134,881. Noted Dec. 11.

Ill., Ottawa—GRAVEL WASHING PLANT—Sheridan Sand & Gravel Co., Moloney Bldg., R. Near, mgr., gravel washing plant on Fox River, incl. 6 bin bulkhead storage, 80 cars daily steel frame, to Link-Belt Co., 300 West Pershing Rd., Chicago. Est. $100,000. Owner taking bids until Jan. 15 150 hp. Diesel engine, 125 kw. generator.

N. J., Wayne — RADIO BROADCASTING STATION—W. A. B. C., Columbia Broadcasting Station System, Inc., M. McAllister, in charge, general contract 2 story, basement, brick, steel broadcasting station, along Passaic River, to J. W. Ferguson Co., 152 Market St., Paterson; fabricating of steel for 700 ft. steel tower, to Blaw-Knox Co., 342 Madison Ave., New York. Est. $40,000 or more. Noted Dec. 25.

N. Y., Long Island City—FERRY TERMINAL—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, ferry terminal, steel towers, ferry bridges, machinery and electrical apparatus, to G. B. Spearen, Inc., 75 West St., New York, $171,500; steel buildings, to J. E. Ogden, 147 Cedar St., New York, $103,000. Noted Dec. 4.

Que., Montreal—FIRE ALARM HEADQUARTERS—City, fire alarm headquarters, Fletcher's Field, to E. G. M. Cape & Co., 620 Cathcart St. $371,387.

MATERIALS

PROPOSED WORK

ROAD OIL—**Springfield, Ill.**—Sangamon Co. and Townships, purchasing, spreading 75 cars road oil on county and township roads. T. L. Flatt, Courthouse, supt. hys.

BIDS ASKED

CULVERT PIPE and BRIDGE LUMBER—**Centerville, Ia.** — Feb. 3, at office Auditor Appanoose Co., corrugated culvert pipe, standard sawed bridge lumber, fir, creosoted piling, nails, paint, hardware.

BRIDGE LUMBER, etc.—**Clarinda, Ia.**—Jan. 23, at office Auditor Page Co., 267,267 b.f. bridge lumber, 15,460 lin.ft. creosoted yellow pine piling, 11,160 lin.ft. corrugated culvert pipe.

CULVERT PILE, LUMBER, PILING, etc.—**Rock Rapids, Ia.** — Feb. 4, at office Auditor Lyon Co., 15, 18 and 24 in. culvert pipe; various quantities lumber, piling, etc.

BANK GRAVEL—**Boston, Mass.**—Jan. 28, by Supply Dpt., furnishing bank gravel to various departments till Dec. 31, delivered as required. P. A. Chapman, supt.

CRUSHED STONE—**Boston, Mass.**—Jan. 27, by Supply Dpt., furnishing crushed stone at various departments till Dec. 31 delivered as required. To exceed $5,000. P. A. Chapman, supt.

CEMENT—**Detroit, Mich.**—Jan. 26, by Dpt. P. Wks., City Hall, Dpt. Purchases and Supplies, 200,000 bbl. portland cement to be furnished as required for season.

ASPHALT, etc.—**Minneapolis, Minn.**—Jan. 26, by F. S. Gram, city purch. agt., 5,700 tons asphalt, 3,000 tons trap rock, and 2,000,000 paving brick. N. W. Elsberg, city engr.

GRAVEL—**St. Paul, Minn.**—Feb. 2, by G. J. Ries, aud. Ramsey Co., 10,000 tons gravel, 2,000 tons sand; 10,000 tons crushed rock to pass 1 in. screen. P. N. Coates, co. surv.

SEWER PIPE—**Providence, R. I.**—Jan. 26, by City, Dpt. P. Wks., Bd. Contr. & Supply, sewer pipe, branches, etc. as specified. $5,000 or more.

PIPE—**Richmond, Va.**—Feb. 2, at office R. K. Compton, dir. P. Wks., precast rein.-con. pipe; adv. E. N.-R. Jan. 22.

CONTRACTS AWARDED

ROAD OIL—**Fresno, Calif.**—D. M. Barnwell, clk. Fresno Co., 125,000 to 175,000 bbl. oil for hys., to Associated Oil Co., Associated Oil Bldg., San Francisco, at $0.49 per bbl. Noted Dec. 18.

PIG LEAD — **Oakland, Calif.** — East Bay Municipal Utility Dist., 50 tons pig lead, to Bunker Hill & Sullivan Mining & Contg. Co., Crocker Bldg., San Francisco, $5,100. Noted Dec. 18.

BRIDGE MATERIALS — **Indianola, Ia.** — Warren Co., C. F. Brown, aud., 380,000 ft. fir lumber, 2,500 butt treated guard rail posts 12,500 ft. treated piling, to Wheeler Bridge Lumber & Supply Co., 606 Hubbell Bldg., Des Moines, $17,210.

GRAVEL — **Mississippi** — State Hy. Comm., Jackson, loading, hauling 1 mi., distributing 55,000 cu.yd. washed gravel, 155,000 cu.yd. clay, 21,500 cu.yd. clay, 771,000 units clay, during period from Jan. 26, to July 25, 5 districts, to Clark & McCaa, Jackson, $87,900; 1 district, to Richton Investment Co., Richton, $33,420.

FUEL OIL, etc.—**Brooklyn, N. Y.**—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to Warner Quinlan Co., 26 Beaver St., New York, 600,000 gal. fuel oil, $18,000, 40,000 gal. fuel oil $1,976, 20,000 gal. furnace oil $1,640, 15,000 gal. kerosene $1,230, 600,000 gal. asphalt cement $25,320; to Shell Eastern Petroleum Products Corp., 122 East 42nd St., New York, 400,000 gal. fuel oil $10,480; to H. C. Peterson, 629 Maple St., 5,000 bbl. cement, $11,750; to W. F. Rourke, 116 77th St., 5,000 cu.yd. cinders $3,450; to New York Trap Rock Co., 103 Park Ave., New York, 4,000 net tons limestone $24,760, 10,000 cu.yd. binder stone $19,300; to M. F. Hickey Co., foot 6th St., 15,500 cu.yd. asphalt sand $13,350, 6,000 cu.yd. sand for paving $5,340. Grand total $136,596. Noted Dec. 25.

FUEL OIL, etc. — **New York, N. Y.** — H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., to Standard Oil Co., 26 Bway., 220,000 gal. fuel oil $8,954; to Warren Quinlan Co., 26 Beaver St., 1,200,000 gal. road oil, $35,160, 550,000 gal. asphalt tar $22,330; to International Combustion Tar & Chemical Co., 200 Madison Ave., 150,000 gal. tar $14,850, 200,000 gal. tar $10,860, 200 tons pitch joint filler $3,300; to Z. Mahoney, 430 Carroll St., Brooklyn, asphalt sand $13,580; to Ames Building Material Co., 3441 Kingsbridge Ave., 10,000 bags portland cement $5,875; to W. J. McCormick Sand & Stone Co., 295 Madison Ave., 5,000 cu.yd. inorganic dust $16,600; to New York Trap Rock Co., 103 Park Ave., 1,600 tons inorganic dust $10,528, 10,000 cu.yd. binder stone $20,700; to H. H. McNeil Lumber Co., 2095 Bway., lumber $3,568; to Cavanaugh Bros., Inc., 89 Warren St., erecting 350 malleable c.i. frames, $4,025. Grand total $170,330. Noted Jan. 1.

EQUIPMENT

PROPOSED WORK

BOILER — **De Kalb, Ill.** — Illinois Power & Light Co., Springfield, A. D. Mackie, genl. mgr., installing new boiler at power plant, $90,000.

TURBINE — **Independence, Mo.** — City, J. Craig, clk., turbine equipment for power plant $25,000. Black & Veatch, 700 Mutual Bldg., Kansas City, engrs.

BIDS ASKED

SOCKETS and CABLE—**Chicago, Ill.**—Jan. 23, by M. J. Kennedy, comr. Gas & Electricity, lamp sockets, single conductor No. 8 A. W. G. standard copper varnished cambric aerial cable for municipal lighting system.

TURBINE-GENERATOR, etc.—**Washington, Ind.**—Jan. 26, by City Council, at office W. Van Trees, city clk., City Hall, 2,000 kw. turbine generator, surface condenser, complete with auxiliary equipment, f.o.b. cars Washington.

ROAD MACHINERY—**Garner, Ia.**—Jan. 27, at office Auditor Hancock Co., three 30 hp. tractors, 6 one-man pull type maintainers, 3 rotary fresnos. C. F. Merten, Garner, co. engr.

TRUCKS—**Fergus Falls, Minn.**—Feb. 10, by W. Lincoln, aud., Otter Tail Co., one or more 2½ to 3½ ton trucks, 4 wheel drive, also one or more patrol graders.

ASPHALTIC MIXER—**Minneapolis, Minn.**—Jan. 27, by F. S. Gram, city purch. agt., 1 asphaltic mixer; chlorinators, vacuum-type, solution feed, for filtration plant. N. W. Elsberg, city engr.

DREDGE—**Toledo, Ore.**—Feb. 2, by C. S. Wilborn, clk. Port of Toledo, 15 in. suction dredge, $45,000.

POWER MAINTAINERS—**Austin, Tex.**—Feb. 16, by State Bd. Control, c/o C. Teer, chn., 4 power maintainers, complete, 10-20 hp. equipped with 12 ft. blade, rubber tired wheels, roller bearings, push type, without scarifier or cab, f.o.b. Ft. Worth. L. A. Fletcher, Austin, equipment engr.

MAINTAINERS—**Beaumont, Tex.**—Jan. 19, by Bd. Comrs. Jefferson Co., B. B. Johnson, judge, 1 or more one-man maintainers for road work.

MAINTAINER—**Marlin, Tex.**—Jan. 31, by Falls Co., M. A. Dowis, aud., one power maintainer.

FOREIGN

Yugoslavia — Kingdom of Serbs, Croates & Slovens, c/o Postal & Telegraph Dpt., Belgrade, taking bids interurban and international telephone systems. To exceed $1,000,000.

Buildings

RESIDENTIAL

BIDS ASKED

Calif., Los Angeles—H. Feigenbaum & Sons, 419 Union Bank Bldg., taking bids on separate contracts 5 story, 75 x 150 ft., rein.-con., brick, steel, 318 South Kingsley St. $175,000. M. Maltzman, 704 Union Bank Bldg., archt. Noted Nov. 6.

Ill., Chicago—See "Contracts Awarded."

N. J., Atlantic City—See "Contracts Awarded."

N. J., Atlantic City — Schultze & Weaver, archts., 18 East 48th St., New York, taking bids general contract 24 story, basement, 145 x 615 ft. brick, steel, plain found., Park Ave. and Boardwalk, for Marlborough Blenheim Hotel, $1,000,000.

N. J., Garfield—M. Gortych, 400 River Rd., and T. Camlet, archt., 26 Piaget Ave., Clifton, taking bids 3 story, basement, brick, steel, 26-28 Van Winkle Ave.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Brooklyn—Ermino Juliano, Inc., 31 94th St., bids in February, general and separate contracts 6 story, 60 x 100 ft., Ridge Blvd. and 93rd St. $175,000. A. Geambalvo, 375 Fulton St., archt.

N. Y., Brooklyn — Jaulin Operating Co., J. Levy, 152 West 42nd St., New York, bids about July, general and separate contracts 20 story, 118 x 221 ft. brick, steel hotel, Plaza St. and Johns Pl. $1,250,000. E. Roth, 1440 Bway., New York, archt. Noted Mar. 14, 1929.

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Residential (Continued)

N. Y., Ithaca—Ezra Cornell Hotel, 25 West 44th St., hotel, $150,000. **Maturity in April.** F. L. Ackerman, 25 West 44th St., New York, archt. Noted May 1.

N. Y., Long Beach—J. Manowitz, bids in April, separate contracts 6 story, 100 x 150 ft. brick, timber apartment hotel, Bway. and Magnolia Blvd. $400,000. H. Hurwitt, 41 West 33rd St., New York, archt. Noted Oct. 2.

N. Y., New York—See "Contracts Awarded."

O., East Cleveland (br. Cleveland)—Chapman Constr. Co., W. F. Panke, mgr., 1116 Standard Bank Bldg., Cleveland, taking bids 3 story, basement, 87 x 150 ft., brick, Chapman Ave. $150,000. R. H. Hinsdale, Erie Bldg., Cleveland, archt.

CONTRACTS AWARDED

Calif., Santa Monica — Windermere Hotels Corp., Ltd., Ocean Ave., 8 story, basement, 60 x 100 ft., rein.-con. timber, Ocean Ave., to Barnett Shapiro Constr. Co., Edwards-Wiley Bldg., Los Angeles, $260,000.

Ill., Chicago—Johnston Bros., 77 West Washington St. (owners and builders) 16 story, T shaped, apartment, Gothic style architecture, fireproof, on 80 x 175 ft. site, 5545 Woodlawn Ave., separate contracts. D. G. Wallace, 22 West Monroe St., archt.

N. J., Atlantic City—H. H. Haas, Guarantee Trust Bldg., 3 story, basement, brick, steel, 3405 Pacific Ave., separate contracts. $150,000. B. Brown, Guarantee Trust Bldg., archt.

N. J., Elizabeth—Martha Curtis Hall Corp., 93 Court St., Brooklyn, 5 story, basement, brick, steel, Murray and Watson Sts., separate contracts. $150,000. S. L. Malkind, 93 Court St., Brooklyn, archt.

N. Y., Brooklyn—J. Barba, 11 West 42nd St., New York, 6 story, 75 x 84 ft., East 19th St., and Albemarle Rd., separate contracts. $225,000. J. Martine, 545 5th Ave., archt.

N. Y., Brooklyn—Kasi Constr. Co., 1562 51st St., apartment, St. Pauls Court and Ocean Ave., day labor and separate contracts. $150,000. W. T. McCarthy, 147 Pierrepont Ave., archt.

N. Y., Brooklyn—Midwood Trading Co., c/o A. Farber, archt., 16 Court St., 4 story, basement, 28th Ave. and 86th St., separate contracts. $150,000.

N. Y., Brooklyn—Montil Realty Co., M. H. Ansorge, pres., 16 Court St., 6 story, 84 x 100 ft., East 4th St. and Brightwater Court, separate contracts. $190,000. Cohn Bros., 361 Stone Ave., archts. Noted Sept. 25.

N. Y., Brooklyn—Premier Assets Corp., 5218 New Utrecht Ave., 6 story, basement, 51st St. and 4th Ave., separate contracts. $150,000. S. L. Malkind, 93 Court St., archt.

N. Y., Brooklyn—Sterling Brook Corp., 1603 Carroll St., 6 story, basement, Brooklyn Ave. and Sterling St., separate contracts. $285,000. J. J. Millman, 67 Court St., archt.

N. Y., Long Island City—City and Suburban Homes, 578 Madison Ave., New York, 4-7 story, 150 x 190 ft., store, apartment, 48th Ave. and 44th St., separate contracts. $150,000. E. Flagg, 109 East 40th St., archt. Noted Jan. 1.

N. Y., New York—Chanin Bros., 122 East 42nd St., apartment, Central Park West and 62nd St., separate contracts. $8,000,000. Excavation awarded to Marcus Contg. Co., 150 Nassau St.; steel and steel erection, to Hay Fdry. Iron Wks., 15 East 26th St. Owner taking bids on other separate contracts. Noted Oct. 30.

N. Y., New York—Nelden Corp., 96 West 162nd St., 6 story store, apartment, 168th and Ogden Sts., separate contracts. $175,000. H. Ginsberg, 205 East 42nd St., archt. Noted Jan. 1.

O., Cincinnati—Mayer Realty Co., 2125 Gilbert Ave., 3 story, basement, brick, rein.-con., plain found., Glencoe St., to Nolte Tillar Bros., Gerke Bldg., $150,000.

CLUBS

PROPOSED WORK

Ill., Chicago—Y. W. C. A., 203 North Wabash Ave., plans by R. S. DeGoyler Co., 307 North Michigan Ave., steel, rein.-con., brick addition, 101 South Ashland Ave. $200,000.

N. J., Glen Ridge—Glen Ridge Country Club, Ridgewood Ave., sketches altering and constructing 2 story, basement, brick, steel addition. $150,000.

Mass., Brockton—Y. W. C. A., B. H. Sprague, pres., 465 Main St., sketches by Allen & Collens, 75 Newbury St., Boston, altering and constructing 2 story, basement, brick addition, Main St. $150,000.

N. J., Newark—Italian Catholic Club, c/o J. Centanni, archt., 142 Market St., revised sketches 2½ story, basement, 75 x 100 ft., brick, steel, plain found. **Summer Ave.** $150,000. Noted Dec. 15 Daily.

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N. J., Weehawken—B. P. O. E., 2 6th St., 3 story, basement, brick, steel club addition, 6th St. and Boulevard E. $150,000. Project in abeyance. W. Mahnken, 401 32nd St., Union City, archt. F. J. Ricker, 685 Hudson Ave., West New York, assoc. archt. Noted Jan. 8.

N. Y., Brooklyn—Y.W.C.A., 189 Montague St., 4 story, club, State and Nevins Sts. $150,000. Project in abeyance. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts. Noted Sept. 25.

BIDS ASKED

Pa., Bradford—Jan. 24, by T. K. Hendryx, archt., 301 Terminal Bldg., 5 story, basement, 82 x 96 ft., brick, steel club building, 2-8 Main St., for Tuna Lodge 411, I. O. O. F., J. Polley, chn. building comn., 111 High St. $175,000. Noted July 31.

HOSPITALS

PROPOSED WORK

Ark., Little Rock—Pulaski County Hospital Assn., W. F. Smith, pres., Donaghey Bldg., probably takes bids soon, four 1 to 3 story, concrete brick, stone buildings for hospital. $600,000. Wittenberg & Deloney, Home Insurance Bldg., archts.

Calif., Arlington—G. B. McDougall, archt., Pub. Wks. Bldg., Sacramento, will not take bids Feb. 3, (1st unit) 2 story, rein.-con. ward building, plain found., for State Hospital, near here. $200,000. Project abandoned. Noted Jan. 15.

Conn., New Britain — New Britain General Hospital, 9 Grand St., sketches by Stevens & Lee, 45 Newbury St., Boston, Mass., (1st unit) nurses home addition, other plans include hospital unit, administration, laboratory buildings, etc., all brick, steel, Grand St. $150,000. Noted Mar. 13.

Conn., Norwich—State, Norwich State Hospital, 2 ward buildings, each $200,000; employees building $150,000, all at State Hospital; also new buildings at Inebriate's Institution, incl. 2 cottages, $40,000, total est. $190,000. Architect not selected.

Mass., Andover—Phillips Andover Academy, c/o J. H. Buttimer, supt. buildings, plans by C. A. Platt, 101 Park Ave., New York, 3 story, basement, 40 x 175 ft., brick, limestone infirmary, on academy grounds. $250,000. **Maturity indefinite.**

Mass., Worcester—Worcester Co. Comn., c/o E. W. Glidden, Court House, plans by Frost, Chamberlain & Edwards, sanatorium, incl. 3 story, 40 x 420 ft. main building, 42 x 130 ft. nurses home, 2 story, 85 x 85 ft. service building, 1 story, 80 x 85 ft. power house, rein.-con., steel, brick, plain found., Huntington Farm. $450,000.

Neb., North Platte—Great Plains Hospital Assn., sketches by C. C. Coursey, 4 Walte Math Bldg., 4 story, 120 x 155 ft., brick, concrete hospital. $150,000.

N. H., Littleton — Littleton Hospital Assn., c/o M. M. Eaton, pres. Bd. Trustees, bids in February, 3 story, basement hospital, power house. $150,000. Rich, Mathesius & Koyl, 320 5th Ave., New York, archts.

N. J., Long Branch—E. C. Hazard Hospital, E. C. Hazard, chn., Washington St., 10 story, 160 x 160 ft., brick, steel, Washington Ave. and Dewey St. $500,000. Architect not selected.

N. Y., Brooklyn—Harbor Hospital, Cropsey and 23rd Aves., bids late in April, general contract 4 story hospital addition. $750,000. P. M. Erickson, 885 Flatbush Ave., archt. Noted Sept. 25.

N. Y., Brooklyn—Shore Road Hospital, Shore Rd. and 91st St., hospital addition. $250,000. **Maturity in March.** Noted Apr. 3.

N. Y., Freeport — Freeport Hospital, D. W. Pine, 25 South Main St., 3 story, Prince and Pennsylvania Aves. $500,000. **Maturity late in fall.** Purdy & Davis, 350 Madison Ave., New York, archts. Noted May 1.

N. Y., New York—New York Infirmary for Women and Children, 312 East 15th St., 21 story hospital, nurses' home, Stuyvesant Sq. $3,000,000. **Maturity about November.** Bottomley, Wagner & White, 112 East 55th St., archts. Noted Apr. 3.

O., Lima—City plans by T. D. McLaughlin, 500 Dominion Bldg., and Hulsken & Strong, 101 North Elizabeth St., hospital, $600,000. Noted Jan. 1.

Wis., Racine—St. Mary's Hospital, c/o Mother Vita, bids probably in spring, 4 story, attic, basement, rein.-con., brick, stone hospital; 4 story, attic, basement, nurses home; 2 story, basement, sub-basement service building; 2 story, basement chapel; 3 story, basement convent, $1,500,000. V. J. Klutho, 910 Syndicate Trust Bldg., St. Louis, Mo., archt. Noted May 15.

BIDS ASKED

Calif., Arlington—Feb. 3, by G. B. McDougall, archt., Pub. Wks. Bldg., Sacramento, (1st Unit) 2 story, rein.-con. ward building, plain found. for new state hospital, near here. $200,000.

Ill., Rock Island—Jan. 26, by Cervin & Stuhr, archts., Safety Bldg., 3 story, basement, 42x156 ft., rein.-con., brick, steel sanitarium, plain found., incl. living quarters, dining room, laboratories, operating rooms, 25th and 17th Sts., for Rock Island County Tuberculosis Assn., 1037 21st St., L. Ostrom, in charge. $150,000.

Mass., Foxboro—Jan. 30, by Commonwealth of Massachusetts, Dpt. Mental Diseases, Boston, 2 story, basement, 2 wings, steel, granite, brick dormitory plain found. for state hospital. $150,000.

N. Y., Central Islip—Feb. 25, by Commissioner Mental Hygiene, State Office Bldg., Albany, altering dining room and kitchen, James Group, altering power house, service connections and power house equipment at Central Islip Hospital. Noted Dec. 25.

N. Y., Brooklyn—Jan. 23, by Dpt. Hospitals, J. G. W. Greef, comr., Municipal Bldg., nurses' home, Greenpoint Hospital, Maspeth, Debevoise and Skillman Aves., C. B. Meyers, 31 Union Sq., New York, archt. Noted Dec. 18.

N. Y., Oxford—Feb. 11, by Superintendent Standards & Purchase, State Capitol, Albany, hospital building for Woman's Relief Corps Home. Noted Dec. 25.

CONTRACTS AWARDED

Conn., Bridgeport—Bridgeport Hospital, Grant St., 3 story, 40 x 78 ft. brick maternity unit, plain found., to E. & F. Const. Co., 94 Wells St., $123,476. Noted Jan. 1.

N. Y., New York—House of Calvary, Featherbed Lane and Macombs Rd., general contract hospital, Featherbed Lane and McCombs Rd., to E. S. Murphy Building Co., 407 East 101st St. Est. $275,000. Contractor taking bids on separate contracts.

N. Y., Yonkers—City of Yonkers, 45 South Bway., general contract clinic and health center, to J. J. McMahon, Brook Ave. and 159th St., New York. Est. $300,000. Excavation under way. Noted Oct. 2.

CHURCHES

PROPOSED WORK

Calif., San Diego — Carmelite Sisters, c/o F. L. Hope, Jr., archt., Bank of Italy Bldg., part 2 and 3 story, 170 x 200 ft., rein.-con. convent, Hawley Ave. $200,000.

Calif., Santa Barbara — First Church of Christ Scientist, sektches by H. H. Gutterson, 526 Powell St., San Francisco, 1 story, rein.-con. garage. $150,000.

Ind., West Lafayette (br. Lafayette) — Methodist Church, A. LeMaster, pastor, sketches rein.-con., brick student building. $1,000,000. J. M. Smith, chn. building comn.

Mass., Belmont (br. Boston) — Belmont Methodist Church, D. J. Imler, pastor, 36 Bellevue St., revised plans by Ripley & LeBoutillier, 45 Bromfield St., Boston, 1 story, basement, Common St. and Palfrey Rd. $150,000. Noted Mar. 20.

Mass., Cambridge—Lutheran Synod of New York and New England, D. Goehring, 7 Buckingham St., plans K. J. Conant, consult. archt., 44 DeWolf St., chapel, Dunster and Winthrop Sts. $150,000 or more. Noted Sept. 4.

N. J., Hawthorne—St. Anthony's Church, W. E. Thompson, pastor, 286 Diamond Bridge Ave., raising $150,000 funds 2 story, basement, brick, steel, plain found. Architect not selected.

N. J., Hoboken — St. Peter and St. Paul Roman Catholic Church, F. E. Bogner, pastor, 404 Hudson St., sisters home, brick, steel, 416 Hudson St. $150,000. Architect not selected.

N. J., Newark—Roseville Presbyterian Church, Roseville Ave., revised plans by R. Nordin, 207 Market St., altering and constructing 2 story, basement, brick, steel Sunday school addition, plain found., Sussex and Roseville Aves. $150,000. Noted Oct. 6.

N. J., Union City—St. Michaels Monastery, E. Goggan, pastor, 381 West St., altering 1 story, basement, West St. $150,000. **Maturity probably soon.**

N. J., Union — Congregation Presbyterian Church, c/o F. A. Elsasser, archt., 1000 Stuyvesant Ave., altering and constructing 1 story, basement, brick, steel chapel addition. $150,000. **Maturity probably in spring.** Noted Jan. 1.

N. Y., Brooklyn—Union Temple, 17 Eastern Parkway, general contract temple, $1,000,000. Project in abeyance. Gehron & Ross, 101 Park Ave., New York, archts. Noted Oct. 2.

N. Y., New York—Fourth Church of Christ Scientist, Fort Washington Ave. and 178th St., revised plans by Cherry & Matz, 441 Lexington Ave., church, Fort Washington Ave. $200,000. Noted Apr. 24.

Ont., Ottawa—St. Joseph's Church, Wilbrod Ave. and Cumberland St., plans by J. G. Morton, 86 Adelaide St., rebuilding 1 story, basement, brick, stone, concrete, recently destroyed by fire. $350,000.

Churches (Continued)

BIDS ASKED

Mass., Somerville (br. Boston)—Jan. 27, by St. Polycarps Roman Catholic Church, J. E. O'Connell, pastor, 65 Temple St., and O'Connell & Shaw, archts., 134 Newbury St., Boston, 1 story, basement, irregular shaped, granite, plain found., Temple St. To exceed $150,000. Noted Jan. 8.

N. J., Dunellen—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, bids about Mar. 15, general contract 2 story, basement, brick, steel parish house, for First Methodist Church, $150,000.

N. J., Perth Amboy—G. W. Brooks, archt., 216 Smith St., bids about Apr. 1, general contract 2 story, basement, brick, steel convent, for St. Mary's Roman Catholic Church, $150,000. Noted Jan. 8.

Ont., Ottawa—J. G. Morton, archt., 86 Adelaide St. E., Toronto, bids about Feb. 1, new church for St. Joseph's Parish, Cumberland St., for English Oblate Fathers of Canada, $350,000.

CONTRACTS AWARDED

Mass., Boston—Eliot Congregational Church, C. C. Keith, 656 Huntington Ave., 1 and 3 story, basement, brick, granite, steel, chapel, parish house, plain found., Dale St., to Somers & Drisco, 120 Boylston St. Est. $150,000.

SCHOOLS

PROPOSED WORK

Calif., Albany (br. Berkeley)—Albany School Dist., election $150,000, additions to Mervin Avenue and Cornell Schools, incl. heating plant for latter structure.

Calif., Redlands — University of Redlands sketches by Marsh, Smith & Powell, Architects Bldg., Los Angeles, part 1 and 2 story, commons building, $150,000; part 1 and 2 story, 130 x 185 ft., Hall of Expressions Building, both Class A rein.-con. $150,000 each.

Calif., Salinas—Salinas City School Dist., election $154,000, 3 new school buildings. A. Walter, city supt.

Conn., Middletown — State of Connecticut, Lone Lane Farm, c/o C. Penniman, plans by Towner & Sellew Associates, 329 Main St., school, incl. cottages, administration building, boiler house service units, $300,000. Noted Oct. 2.

Ill., Springfield—Concordia Theological Seminary, 12th St. and Enos Ave., H. A. Kelin, pres., administration building, 12th St. and Enos Ave. $200,000.

Md., Baltimore—Bd. Awards approved specifications addition to Negro School, Preston, St. and Druid Hill Ave., $150,000.

Massachusetts — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 2 or 3 story, brick, steel school for feeble minded. To exceed $150,000. Architect and site not selected.

Mass., Braintree—Town, c/o D. E. Fisher, supt. schools, Town Hall, sketches Junior High School, $150,000—$200,000. Architect not selected.

Mass., Charlestown (sta. Boston)—City of Boston, Dpt. School Buildings, sketches by J. M. Gray, 175 High St., Boston, intermediate school, 3 story, basement, brick, limestone, plain found. $640,000. Noted Nov. 6.

Mass., Hamilton—Town, c/o J. Lamson, chn. Bd. Selectmen, sketches, 2 story, basement high school, probably brick, stone. $150,000. Architect not selected.

Mass., Quincy (Ind. br. Boston)—City, T. J. McGrath, mayor, sketches Junior High School, brick, West Quincy sect. $200,000. Architect not selected.

Mass., Quincy—City, c/o H. H. Muir, supt. Schools, altering and constructing 3 story, basement, brick addition to North Junior High School, Hancock and East Squantum Sts. $150,000 or more. Architect not selected.

Mass., Springfield — South Congregational Church Society, J. G. Gillsey pastor, 127 Mulberry St., pastor, sketches school, High St. $150,000. Architect not selected.

Mass., Townsend—Town, R. Lancey, member School Bd., plans by C. R. Whitcher, Beacon Bldg., Manchester, N. H., 2 story, basement, brick, stone high and grade school, plain found., Centre St. $150,000. Noted July 17.

Mass., Wellesley (br. Boston)—Town, Superintendent of Schools, plans by B. Proctor, Jr., 173 Milk St., Boston, 2 story, basement, brick school, Fells Sect. $150,000 or more.

Mass., Weston — Town, c/o Bd. Selectmen, sketches new high school. $225,000 appropriated. Architect not selected.

Mass., Worcester—City, Pub. Building Dpt., City Hall, plans by Frost, Chamberlain & Edwards, 390 Main St., 2 story, basement, brick, steel, concrete grammar school, Heard St. $150,000. Noted Dec. 19, 1929.

Mass., Worcester—City, Pub. Bldg. Dpt., City Hall, plans by E. T. Chapin, 340 Main St., 2 story, basement, brick, steel school addition, Andover St. $150,000.

Mo., St. Louis—Bd. Educ., 911 Locust St., plans by E. T. Friton, building comr., c/o owner, 3 story, basement high school, Kingshighway and Arsenal St. $900,000; 3 story grade school, Wilmington Ave. and Bowen St., $360,000.

N. J., Blairstown—Blair Academy, sketches 1 story, basement, 80 x 130 ft., brick, steel, stone auditorium, $150,000.

N. J., Clifton — Bd. Educ., High School, 2 story, basement, brick, steel, rein.-con., plain found., Richfield Sect. $150,000. Architect not selected.

N. J., Clifton—Bd. Educ., High School Bldg., School 3, 2 story, basement, brick, steel, Clifton Ave. $250,000. Project in abeyance. Lee & Hewitt, 152 Market St., archts. Noted Dec. 4.

N. J., Dover — Bd. Educ., High School, 2 story, basement, brick, steel, McFarlan St. and State Hy. $150,000. Architect not selected.

N. J., Hawthorne — Bd. Educ., Lafayette School, for Central School, 2 story, basement, brick, steel, plain found., Warburton and Parmalee Aves. $200,000. Project in abeyance. Noted Dec. 4.

N. J., Jersey City—Talmud Torah, H. Ruskin, pres., 284 4th St., will not build Jewish School, 2 story, basement, $150,000. Project abandoned. Noted Jan. 17, 1929.

N. J., Lakewood—Bd. Educ. will not build 2 story, basement, brick, steel, plain found. $150,000. Project in abeyance. C. C. Cook, Asbury Park Trust Bldg., archt. Noted Oct. 25.

N. J., Lakewood—Bd. Educ., 2 story, basement, brick, steel high school. $200,000. Architect not selected.

N. J., Linden—Bd. Educ., St. George Ave., 2 story, basement, brick, steel school addition, Wood Ave. Project in abeyance. $150,000. H. B. Brady, Inc., 333 North Broad St., Elizabeth, archt. Noted Dec. 18.

N. J., Newark—Institute For Advanced Study, 602 Center St., South Orange, brick, steel college, plain found. $5,000,000. Project in abeyance. Noted June 27.

N. J., Newark—Bd. City Comrs., City Hall, preliminary plans Raymond Memorial, incl. landscaping, headworks, walks between buildings. $45,000. J. Costello, city engr.

N. J., New Market—Bd. Educ., will not build 2 story, basement, brick, steel school, Washington Ave. and West 7th St. $150,000. Project abandoned. Noted Nov. 27.

N. J., New Market—Bd. Educ., will not build 2 story, basement, brick, steel, River Rd. $150,000. Project abandoned. Noted Nov. 27.

N. J., Orange—Carteret Academy, 317 Carteret Pl., 2 story, basement, brick, steel, school, Orange Mt., $150,000.

N. J., Phillipsburg—Bd. Educ., High School, bids probably about Mar. 1, 2 story, basement, brick, steel, Ingersoll Heights. $150,000. A Merchant, 1 Elm Row, New Brunswick, archt. Noted Jan. 8.

N. J., Rumson — Bd. Educ., B. H. Borden, pres., 2 story, basement, brick, steel high school, Ridge Rd. $150,000. Project in abeyance. Noted Dec. 4.

N. J., Sea Bright — Bd. Educ., Sea Bright, altering and constructing 2 story, basement, brick, steel addition, plain found., River St. $150,000. H. B. Seymour, 512 McClellan Ave., Long Branch, archt. Noted Dec. 18.

N. J., Washington—Bd. Educ., 2 story, basement, brick, steel high school, North Carlton Ave. $150,000. Project in abeyance. C. Granville Jones, 133 Academy St., Belleville, archt. Noted Jan. 8.

N. Y., Cold Spring—Bd. Educ. Dist. 13, bids about April, general contract school. $250,000. Knappe & Morris, 171 Madison Ave., New York, archts. Noted Nov. 20.

O., Berea—Baldwin-Wallace College observatory, on campus. $150,000.

Pa., Irwin—Bd. Educ., North Hunting Twp., D. J. Brentzel, pres., plans by Hunter & Caldwell, Central Trust Bldg., Altoona, 4 brick, steel consolidated elementary schools. R. J. Brooker, Woolworth Bldg., Greensburg, engr.

Pa., McKeesport—Bd. Educ., J. B. Ritchey, supt., Ariel Bldg., sketches by C. R. Moffitt, 304 Masonic Temple, brick, steel industrial school, near present high school. $600,000.

Pa., McKeesport — Bd. Educ., J. B. Ritchey, supt., Ariel Bldg., sketches by Schwab, Palmgreen & Merrick, Koppers Bldg., and bids probably in May, brick, steel grade school. $180,000.

Pa., Munhall—Bd. Educ. sketches by A. G. Wickerham, 135 East 8th Ave., Homestead, brick, steel school, incl. auditorium, gymnasium, Woodlawn Ave. $300,000.

Pa., Pittsburgh — Bd. Educ., Administration Bldg., sketches by Schwab, Palmgreen & Merrick, 1707 Koppers Bldg., elementary school addition to Arsenal Junior High School, Butler and 40th Sts. $500,000. **Maturity early in 1932.**

Tex., Galveston — Independent School Dist. plans by R. R. Rapp, Guaranty Bldg., Junior High School, Giesecke & Harris, Norwood Bldg., Austin, assoc. archts.; also plans by A. Fraser, A.N.I. Bldg., remodeling present school buildings. $800,000. Noted Jan. 8.

Ont., London—Bd. Educ., W. R. Martin, chn., Technical School addition, new equipment. $200,000.

Ont., Toronto—University of Toronto, Queens Park, 2 or 3-story basement building for Academy of Medicine, Grosvenor St. and Queens Park Crescent. $250,000. Architect not selected.

Ont., St. Catharines — Ridley College soon takes bids 3 story, basement, brick, stone, steel, concrete dormitory buildings. $150,000; also plans dining hall, tower and classrooms. Total $500,000. Marani, Lawson & Morris, 38 Bloor St. W., Toronto, archts. Noted Jan. 9, 1930.

Que., Okla.—J. H. Caron, archt., Nicolet, bids in spring, superstructures of agricultural school buildings, for Trappist Fathers. $700,000.

BIDS ASKED

Calif., Oakland—H. A. Minton, archt., Bank of Italy Bldg., San Francisco, taking bids group rein.-con. high school buildings, Piedmont Highlands, for Roman Catholic Archbishop, 1100 Franklin St., San Francisco. $300,000. Noted Jan. 1.

Calif., Pasadena — California Institute of Technology taking bids two 2 and 3 story, rein.-con. college buildings, incl. geology, laboratory and astrophysics laboratory. $500,000. Mayers, Murray & Phillip, Bertram G. Goodhue, associated, 2 West 47th St., New York, archts.

Conn., New Canaan—Town, Bd. Educ., taking bids Junior High School, 2 story, basement, brick, steel, incl. auditorium, gymnasium, South Ave. $275,000. John Noble Pierson & Son, 198 Jefferson St., Perth Amboy, N. J., archts. Noted Jan. 1.

Ind., Chesterfield—See "Contracts Awarded."

Ind., Richmond—Feb. 5, by School Comrs., Hibberd High School and 3 grade school buildings, brick, steel, $228,000. Hamilton, Fellows & Nedved, 814 Tower Bldg., Chicago, Ill., archts. Noted Jan. 8.

Mass., Springfield—See "Contracts Awarded."

Mo., St. Joseph — Bd. Educ., A. L. Loving, secy., bids about Feb. 15, Lindbergh School, 2 story, basement, rein.-con., brick, stone, St. Joseph and Concord Aves. $160,000. W. B. Ittner, Inc., Continental Life Bldg., St. Louis, and W. Siemens, 503 Bartlett Bldg., archts. Noted Dec. 18.

N. J., Blairstown—Jan. 27, by Starret & Van Vleck, archts., 393 7th Ave., New York, general contract 1 story, basement, 80x130 ft., brick, steel, stone auditorium, for Blair Academy, Blairstown. $150,000.

N. J., Bridgeville—Bd. Educ., White Twp., W. Lantz, clk., bids about Feb. 1, 1 story, basement, brick, steel consolidated school. $150,000. Jacoby & Everett, Commonwealth Bldg., Allentown, Pa., archts. Noted Dec. 11.

N. J., Bloomfield—Bd. Educ., City Hall, bids about Mar. 1, general contract 2 story, basement school, Watchung and Broughton Aves. $250,000. Bartlett & Marsh, Lefcourt Bldg., Newark, archts. Noted Jan. 8.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Feb. 1, general contract Junior High School, 3 story, basement, brick, steel, Myrtle Ave. and Delmar Pl. $400,000. V. H. Stromback, 1243 Springfield Ave., archt. Noted Nov. 13.

N. J., Little Ferry—Bd. Educ., J. Cronin, pres., Boro Hall, bids about June 1, Washington School, 2 story, basement, brick, steel. $150,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Jan. 1.

N. J., Wyckoff—Bd. Educ., School Bldg., bids about Feb. 15, 2 story, basement, brick, steel, rein.-con., school, Grand View Ave. $150,000. Lee & Hewitt, 152 Market St., Paterson, archts. Noted Jan. 8.

N. Y., Brooklyn—Jan. 27, by W. C. Martin, archt. and supt., School Buildings, Flatbush Ave. extension and Concord St., general contract addition to P. S. 228 (David A. Boody Junior High School), Avenue S, West 4th and West 5th Sts., for Bd. Educ., 500 Park Ave., New York. Noted Jan. 8.

N. Y., New York—Jan. 30, by W. C. Martin, archt. and supt., School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract Samuel Gompers Industrial High School for Boys, Tinton and Wales Aves., East 145th Sts., for Bd. Educ., 500 Park Ave.

N. Y., Rochester—Colgate Divinity School bids about Feb. 1, general contract college divinity school, $1,000,000. James Gamble Rogers, 154 East 46th St., New York, archt. Noted Dec. 12, 1929.

O., Painesville—Bd. Educ., E. Tucker, clk., taking bids two 1 and 2 story, brick, steel, concrete school buildings. $150,000. Fulton & Taylor, 8201 Euclid Ave., Cleveland, archts.

Pa., Apollo — Jan. 26, by Bd. Educ., J. C. Hunter, pres., 2 story, basement, 124 x 163 ft., brick, hollow tile, limestone high school, incl. auditorium, gymnasium, woodworking shop.

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Schools (Continued)

domestic science, Pennsylvania Ave. $150,000. H. H. Rogers, Johnstown Trust Bldg., Johnstown, archt. Vans, Eng. Serv., Blairsville, engrs.

Tex., Galveston—University of Texas, Bd. Regents, J. W. Calhoun, comptroller, Austin, bids about Jan. 26, general contract 4 story, brick, stone laboratory. $350,000. H. M. Greene, LaRoche & Dahl, 307 Constr. Industrial Bldg., Dallas, archts. C. L. Kribs, Southwest Life Bldg., Dallas, mechanical engr. Noted Nov. 13.

Tex., San Antonio—Society of Mary, J. Waldron, St. Marys Academy, 112 College St., taking bids superstructure 3 story, basement, 140x180 ft., rein.-con., brick, North St. Mary's St. $400,000. H. Dreisoerner, 3828A Arsenal St., St. Louis, Mo., archt. Lilly-Drought Co., Frost Bldg., engrs. Foundation work in progress by separate contract. Noted Dec. 11.

Ont., Toronto — Jan. 29, by Mathers & Holdenby, archts., 96 Bloor St. W., general contract Botany Building, 3 story, basement, 123 x 142 ft., rein.-con., stone, for University of Toronto. $400,000. Noted Jan. 15.

CONTRACTS AWARDED

Calif., Berkeley—G. B. McDougall, archt., Sacramento, general contract 1 and 2 story rein.-con. boys and girls dormitory, kitchen, commissary, dining room buildings, to Monson Bros. 475 6th St., San Francisco, $172,740; plumbing, heating and ventilating, to G. A. Schuster, 3712 Grove St., Oakland, $35,791. Noted Dec. 25.

Calif., Santa Barbara—Santa Barbara School Dist., Jefferson School, 2 story, concrete, to Baker & Robinson, 732 D St., San Bernardino, $109,300 (exclusive of plumbing and heating). Noted Dec. 18.

Ind., Chesterfield—Indiana Spiritualists, excavating contract 2 story, basement, 115 x 140 ft., rein.-con., brick, steel, stone, college, separate contracts. $150,000. Private plans. Noted Sept. 18.

Ind., Eminence—Morgan Co., general contract brick, steel school, to J. Mann, Mooresville. Est. $150,000. Noted Dec. 11.

Mass., East Boston (sta. Boston) — Dpt. School Buildings, Boston, 2 story, basement, brick, limestone, granite, plain found., to John Bowen Co., 129 Newbury St., Boston, $114,929. Noted Dec. 11.

Mass., Springfield—J. W. Foster, archt., 105 Bridge St., 2 and 1 story, basement, brick, stone, plain found., Chestnut St., for Hebrew Free School Assn., N. E. Goldstein, 103 Bridge St., day labor, under supervision of architect. $150,000. Noted Dec. 4.

Minn., St. Paul—Dpt. Educ., general contract 2 story, basement, rein.-con., brick, to Interstate Contg. Co., 769 Vandalia St., $107,200. Noted Dec. 18.

Pa., Munhall—Bd. Educ., L. J. Holman, pres., 700 11th Ave., 2 story, basement, 70 x 111 ft., brick, hollow tile, to Morgan & Co., 8th Ave., Homestead. Est. $150,000. Noted Dec. 25.

Wis., Milwaukee—Bd. School Directors, excavating and concrete work for Steuben Junior High School, West Meineckia St., to Paul Riesen's Sons Co., 2660 North Humboldt Ave., $136,632; structural steel, to Lakeside Bridge & Steel Co., 3200 Villard Ave., $54,885. Noted Jan. 5.

THEATRES

PROPOSED WORK

California—United Artists Theatres of California Ltd., 931 South Bway., Los Angeles, plans by Walker & Eisen Ltd., and C. A. Balch, assoc. archts., Western Pacific Bldg., Los Angeles, 7 to 15 theatres in various southern cities. $50,000-$200,000 each.

California—United Artists Corp., 1966 South Vermont Ave., Los Angeles, sketches theatres in Richmond, Berkeley, San Jose, and Palo Alto. $75,000-$200,000 each. Architect not selected.

Ky., Ashland — Paramount Publix Theatres, Paramount Bldg., New York, theatre. $50,000.

Mass., Brookline (br. Boston)—J. D. Murphy, 19 Clark Rd., sketches theatre, Coolidge Corner. $150,000 or more.

Mass., Brookline (br. Boston)—G. W. Wightman, 3 Charles St., sketches theatre, stores, parking space, Sewell Ave., Beach and Harvard Sts. $150,000 or more.

Mass., Brookline (br. Boston)—W. S. Young, 18 Webster St., sketches theatre, 234-236 Harvard St. $150,000-$160,000. Private plans.

Mass., Brookline (br. Boston) — Corporation c/o J. H. Bickford Co., archts., 6 Beacon St., Boston, sketches theatre, Beacon St. $150,000 or more. Radio-Keith Orpheum Corp., 1564 Bway., New York, lessee.

Mass., Winchester—G. A. Daley, et al., 247 Forest St., sketches steel, brick theatre. To exceed $150,000. Architect not selected.

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N. Y., Brooklyn — Fox Theatres, Inc., 850 10th Ave., New York, will not build theatre, Fulton and Bedford Aves. $700,000. Project abandoned. Noted May 8.

O., Elyria — Paramount Publix Theatres, Paramount Bldg., New York, soon lets contract theatre. $1,000,000. Rapp & Rapp, Paramount Bldg., New York, archts. Noted Nov. 13.

Okla., McAlester—Wallace Wilkinson sketches 3 story theatre, Main St. $150,000. Architect not selected.

Va., Charlottesville — Paramount Publix Theatres, Paramount Bldg., New York, sketches theatre. To exceed $200,000.

Que., Montreal — National Conservatoire of Music, E. Lagrew, pres., concert hall, St. Dennis St. $300,000.

BIDS ASKED

N. J., Newark—State Builders, Inc., (contractors), 24 Commerce St., taking bids on separate contracts 2 story, basement, brick, steel theatre, for Elwood Theatre, c/o Harris & Sohn, archts., 17 Mechanic St. Est. $150,000. Noted Jan. 8, under "Contracts Awarded."

N. J., Perth Amboy—Feb. 3, by J. Eberson, archt., 370 Lexington Ave., New York, general contract 2 story, basement, 105 x 235 ft., brick, steel, rein-con. theatre, stores, Smith and Maple Sts., for Norkin Co., c/o Warner Bros. Pictures, Inc., 321 West 44th St., New York, $1,000,000. Ruderman & Severnd, 370 Lexington Ave., New York, engrs. Noted Jan. 15.

O., Mansfield—Warner Bros., Inc., c/o H. B. Warner, 321 West 44th St., New York, bids about Mar. 1, general contract 2 story, theatre, incl. stores. $350,000. J. Eberson, 370 Lexington Ave., New York, archt. Noted Dec. 11.

CONTRACTS AWARDED

N. Y., Glens Falls — Paramount Publix Theatres, Paramount Bldg., New York, theatre, to Thompson Starret, 250 Park Ave. Est. $250,000. Noted Jan. 15.

N. Y., Newburgh — Paramount Publix Theatres, Paramount Bldg., New York, theatre, to Thompson Starret, 250 Park Ave., New York. Est. $250,000. Noted Jan. 15.

N. Y., New York—Earl Carroll Theatre, 577 7th Ave., theatre, to M. Shapiro & Son, 1560 Bway. Est. $1,000,000. Noted Dec. 25.

O., Fremont — Paramount Publix Theatres, Paramount Bldg., New York, 3 story, basement, 85 x 165 ft., rein.-con., brick theatre, incl. stores, to Thompson Starrett, 250 Park Ave., New York. Noted Oct. 30.

BANKS

PROPOSED WORK

Calif., Oakland — Italian Natl. Building & Loan Assn., 524 Montgomery St., San Francisco, plans by F. E. Barton, Crocker Bldg., San Francisco, 2 story, basement, steel, concrete bank, office $150,000.

N. Y., Olean—First National Bank, 101 Union St., bank addition, $150,000. **Maturity in April or later.** W. Potter, 22 East 17th St., New York, archt. Noted May 8.

CONTRACTS AWARDED

Mass., Winchester—Winchester Co-Operative Bank, J. Challis, pres., and E. R. Wait, archt., Lawson Rd. extension, 1 story, basement, rein.-con., brick, limestone, granite, concrete found., Vine St. to John M. Tobin, Inc., 40 Central St., Boston. $150,000. Noted Dec. 18.

N. Y., New York—Centrun Corp., F. J. Fuller, pres., 70 Bway., 3 story bank, 35 East 72nd St., to W. Crawford, 7 East 42nd St. Est. $150,000. Noted Jan. 8.

N. Y., Syracuse — Onondaga Savings Bank, altering bank, to J. D. Taylor Constr. Co., 115 South Salina St. Est. $500,000. Noted Dec. 4.

OFFICES

PROPOSED WORK

N. J., Newark — Majestic Radio Co., 259 Madison Ave., revised sketches by W. E. Lehman, 972 Broad St., Newark, 2 story, basement, 150 x 250 ft., brick, steel office, warehouse, showrooms, Frelinghuysen Ave. $200,000. Noted Nov. 13.

N. Y., New York—United States Land & Impvt. Co., 1465 Bway., 23 story, 49x86 ft., rein.-con., brick top addition, 1465 Bway. $920,000. **Maturity about April.** E. G. Faber, 784 Park Ave., archt. Noted Sept. 11.

Pa., Pittsburgh—West Penn Power Co., West Penn Power Bldg., sketches by R. Irvin, 99 Vandergrift Bldg., brick, steel, probably stone, 2nd and Wood Sts. **Maturity indefinite.**

Vt., Bellows Falls—Vermont Newspaper Corp., c/o W. E. Belknap, plans by H. H. Owen, 3 North State St., Concord, N. H., office and manufacturing building. $150,000 or more.

BIDS ASKED

N. J., Jersey City — Spingarn Realty Co., J. Spingarn, pres., 590 Summit Ave., new bids about Mar. 1, general contract 9 story, basement, 100 x 120 ft., brick, steel, rein.-con office, stores, Newark and Oakland Aves., $750,000. W. Neumann, 26 Journal Sq., engr. and archt. Noted Dec. 11.

CONTRACTS AWARDED

Ind., Ft. Wayne—Lincoln National Life Insurance Co., 1300 South Harrison St., general contract 4 story, basement, 60 x 100 ft., rein.-con., stone, to Hegeman-Harris Co., 431 North Michigan Ave., Chicago, Ill. Est. $250,000 Noted Jan. 14.

Pa., Phila.—W. Freihofer, 20th and Indiana Sts., 10 story, basement, 110x114 ft., rein.-con., brick, steel, plain found., 69th and Sansom Sts., to G. Kessler Co., 1733 North Marvine St. archt.

STORES

PROPOSED WORK

Mass., Boston—Owner, c/o Richmond Bros. Co., 1600 East 55th St., Cleveland, O., sketches altering and constructing 8 story, basement, 30,000 sq.ft. floor space, brick, steel, stone addition, Washington St. and Bedford Sts. $150,000. Private plans.

Mass., Cambridge—C. P. Cronin, 45 Fresh Pond Parkway, plans by W. L. Galvin, 34 Brattle St., 3 story, basement, brick, store, incl. office, 34-42 Church St., corner Palmer St. $150,000.

N. J., Jersey City—M. Z. Hurwitz Co., M. Z. Hurwitz, pres., 921 Bergen Ave., brick, steel store, office, Newark Ave. and Barrow St. $250,000. **Maturity indefinite.** W. T. Grant, 455 7th Ave., New York, lessee. Architect not selected. Noted Dec. 25.

N. Y., White Plains—H. M. Palmer, 152 West 42nd St., New York, 50 x 140 ft. store, office, 178 Mamaroneck Rd. $150,000. **Maturity in April.** Noted Oct. 9.

BIDS ASKED

Ill., Chicago—A. Epstein, archt., 2001 West Pershing Rd., taking bids 2 story, basement, 60 x 170 ft., rein.-con., Indiana limestone, brick, steel store, 63rd and Green Sts., for Chicago City Bank & Trust Co., 815 West 63rd St. $200,000.

Mass., Boston—Owner, c/o Blackall, Clapp, Whittemore & Clark, 31 West St., archts., taking bids 22 story basement, 85x265 ft. rein.-con., steel, limestone store, office, conc. found. Berkeley St. and St. James Ave. $4,000,000.

N. J., Newark—Owner, c/o E. A. McMurray, archt., 339 Millburn Ave., Millburn, bids about Apr. 15, general contract 2 story, basement, brick, steel store, apartment, 18th and Melrose Aves. $150,000,

N. J., Newark—See "Contracts Awarded."

N. Y., Jamaica—Gross Constr. Co., 160-16 Jamaica Ave., taking bids general contract 2 story, 110 x 193 ft. store, Jamaica Ave. and 164th St. $185,000. M. Klein, 65 Court St., Brooklyn, archt. Noted Nov. 13.

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

Wis., Beloit—Jan. 27, by M. R. Rosman, archt., 743 North 11th St., Milwaukee, 4 story, basement, 66x100 ft. store, for E. L. Chester & Co.

CONTRACTS AWARDED

N. J., Newark — P. J. Hoey (general contractor), 166 Montague St., Brooklyn, 1 and 2 story, basement, 95 x 330 ft., steel, brick, concrete stores, swimming pool, 235-9 Clinton Ave., separate contracts. $150,000. F. Grad, 1023 Broad St., archt.

PUBLIC

PROPOSED WORK

Conn., Newtown—LIBRARY—Town, T. F. Brew, chn., plans by P. N. Sunderland, 248 Main St., Danbury, Cyrenius H. Booth Memorial Library, brick, stone, Main St. $200,000. Noted Nov. 20.

Mass., Beverly—FIRE and POLICE STATION—City, J. A. Torrey, mayor, City Hall, sketches fire alarm headquarters and police station combined unit. $150,000. Architect not selected.

Mass., Boston—MUNICIPAL—City, Dpt. P. Buildings, sketches municipal building, Franklin Park-Franklin Field Sect., Dorchester. $400,000. Architect not selected.

Mass., Boston—POLICE STATION—City, Dpt. Pub. Buildings, City Hall, sketches police station to house Hanover and Joy Street Stations. $350,000. Architect not selected.

Mass., Boston—PUBLIC WELFARE—City, Dpt. P. Bldgs., public welfare building. To exceed $150,000. Architect not selected.

Mass., Dorchester (Sta. Boston)—MUNICIPAL—City of Boston, Dpt. P. Buildings, sketches municipal building at Franklin Field $400,000. **Maturity this year.** Architect not selected.

Mass., Natick—COURT HOUSE and POLICE STATION—Town, c/o J. B. Morse, chn. Building Com., altering and constructing 2 story, basement addition, Summer St. $150,000. Architect not selected.

Public (Continued)

Mass., Westboro—DORMITORY and KITCHEN —Commonwealth of Massachusetts, Dpt. Mental Diseases, soon takes bids 1 and 3 story, basement, brick, steel, plain found., at state hospital. $150,000. W. E. Boyd, 109 State House, engr. Noted Dec. 25.

N. J., Hillsdale—MEDICAL—Dpt. Institutions & Agencies, State Office Bldg., Trenton, plans by Guilbert & Betelle, 20 Branford Pl., Newark, 3 story, basement, brick, steel, rein.-con. medical building. $1,500,000. C. N. Leathem, Jr., Div. Architecture & Constr., State Office Bldg., Trenton, state archt. Noted Dec. 25.

N. Y., Jamaica—CHILDREN'S COURT—G. U. Harvey, pres. Queens Boro. Queens Subway Bldg., Long Island City, bids in March or later, general contract 2½ story children's court, Union Hall St. and South Rd. $200,000. Noted Jan. 1.

N. J., Newark — FIRE HOUSE — Bd. City Comrs., City Hall, plans by F. Grad, 1023 Broad St., 2 story, basement, brick, steel, plain found., 18th Ave. and Norwood St. $150,000.

N. J., North Bergen—FIRE HOUSE, GARAGE and SIGNAL STATION — Bd. Town Council, Town Hall, revised sketches by R. G. Glenn, engr. and archt., Town Hall, 2 story, basement, brick, steel. $150,000. Noted Sept. 26.

N. Y., Brooklyn — MUSEUM — Brooklyn Museum, Eastern Parkway, bids in February, general contract museum addition, Eastern Parkway and Washington Ave. $265,000. McKim, Meade & White, 101 Park Ave., New York, archts. Noted Nov. 6.

N. Y., Mount Kisco—FIRE HOUSE and MUNICIPAL—Village, fire house and municipal building. $150,000. **Maturity in May.** J. W. Schmit, 1440 Bway., New York, archt. Noted Mar. 19.

N. Y., New York—LIBRARY—Bd. Trustees New York Public Library, 42nd St. and 5th Ave., 3 story, brick, steel addition. $2,000,000. Project in abeyance until December. Carrare & Hastings, 52 Vanderbilt Ave., archts. Noted Apr. 24.

N. Y., Wellsville—LIBRARY—D. A. Howe Memorial Library, c/o E. L. Tilton, archt., 420 Lexington Ave., New York, library, $400,000. Project in abeyance. Noted Oct. 2.

Okla., Shawnee — COURT HOUSE — Pottawatomie Co., court house. $300,000. C. E. Pettigrew, clk.

Okla., Stillwell—COURT HOUSE—Adair Co. revised plans by Huseman Co., 1st Natl. Bank Bldg., Chickasha, 3 story, basement, 58 x 88 ft., rein.-con., brick, stone. Former bids rejected. $100,000. Noted Dec. 4.

R. I., East Providence (br. Providence)—FIRE STATION—Town, W. E. Smythe, town clk., sketches by M. Traficante, 175 Taunton Ave., fire station, Rumford Dist. 3 and Central Station 1. $150,000.

Que., Montreal—FIRE and POLICE STATIONS—City soon takes bids 2 fire and police stations, one on Hochelaga St., Maisoneuve Ward, and other on Shamrock St., St. John's Ward. $250,000 each.

BIDS ASKED

Minn., Red Wing—COURT HOUSE—Feb. 24, by Goodhue Co., C. T. Taylor, aud., 3 story, basement, 102 x 136 ft., rein.-con., brick. $250,000. Buechner & Orth, 500 Shubert Bldg., St. Paul, engrs. Noted June 24.

N. Y., Attica—PRISON—Feb. 26, by Commissioner Correction, State Office Bldg., Albany, administration building, hospital, laundry and bath building, state shop, shop, textile shop, maintenance storehouse, addition to prison wall and service connections at Attica State Prison. Noted Dec. 25.

N. Y., Comstock—ADMINISTRATION—Feb. 19, by Commissioner Correction, State Office Bldg., Albany, administration building, Great Meadow Prison. Noted Sept. 18.

N. Y., Syracuse—ARMORY—Mar. 12, by Adjutant General, Capitol, Albany, addition to State Armory. Noted Dec. 25.

N. Y., Thiells—FARM GROUP—Feb. 25, by Commissioner Mental Hygiene, State Office Bldg., Albany, farm barns, dairy building, farm colony dormitory, at Letchworth Village. Noted Dec. 25.

Tex., Abilene—JAIL—Jan. 29, by Taylor Co., T. K. Eplen, judge, 4 story, 53 x 57 ft., brick, steel. $100,000 or more. D. S. Castle Co., 701 Alexander Bldg., archt. Noted Dec. 11.

CONTRACTS AWARDED

Mass., Fall River—FIRE STATION—City, E. P. Talbot, 2 story, basement, brick, stone, plain found., to J. F. Mooney, Academy Bldg., $128,450. Noted Dec. 18.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Glendora — HOME — Katherine Bayer Hensler, Los Angeles, sketches by Foss Co., 171 South Los Robles Ave., Pasadena, Class A home for aged, Sierra Madre Blvd. and Dalton Canyon. To exceed $500,000.

Ia., Des Moines—COMMERCIAL—L. Kurtz, 312 Walnut St., sketches 4 or 6 story, basement, 80 x 132 ft., brick, concrete, 4th and Walnut Sts. $200,000.

Mo., St. Louis—BUS TERMINAL, etc. — Pickwick-Greyhound Lines, Inc., S. O'Neil, dist. mgr., Union Market Bus Terminal, sketches rein.con., brick, stone bus terminal, hotel, $1,500,000 up.

N. Y., Jamestown—RAILROAD STATION — Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, bids in April, general contract passenger railroad station. $300,000. Noted Oct. 2.

N. Y., New York—J. J. Dietz, comr. Water

N. Y., Yonkers—HOME—New York Guild for Jewish Blind, 200 West 72nd St., New York, general contract home for blind, Saw Mill River Parkway. $500,000. Project in abeyance. W. Katz, Yonkers, archt. Noted May 1.

Pa., Youngwood—POOR FARM BUILDINGS —Poor Farm, J. S. Hamberg, dir., Westmoreland Co., Greensburg, improvements, incl. bed rooms, dining rooms, recreational facilities. $500,000.

BIDS ASKED

Ill., Chicago — STATION — Illinois Central R.R. Co., 135 East 11th Pl., A. F. Blaess, ch. engr., taking bids steel work for 2 story, 128 x 240 ft. railroad station, Randolph St. and North Michigan Ave. Soon take bids on superstructure. Foundation in. D. F. McLaughlin, 109 East Roosevelt Rd., archt. Noted Aug. 7.

Md., Baltimore—FRUIT EXCHANGE—Feb. 21, by Pennsylvania R.R. Co., Broad St. Sta., Phila., Pa., T. J. Skillman, ch. engr., 1 and 2 story, 72 x 660 ft., brick, steel, hollow tile, Mt. Vernon Yards. W. H. Cookman, c/o owner, archt.

N. Y., Maspeth—TERMINAL—Koch & Wagner, archts., 32 Court St., Brooklyn, taking bids on separate contracts terminal on Newtown Creek, for H. C. Boback Co., Flushing and Metropolitan Aves. $2,000,000. Noted Oct. 2.

CONTRACTS AWARDED

Mass., Lynn—EXCHANGE — New England Telephone & Telegraph Co., 50 Oliver St., excavating for 3 story, basement, 16,500 sq.ft. floor space, brick, stone, concrete, plain found., Essex and Washington Sts., to M. McDonough Co., 821 Bway., Saugus. Est. $25,000. Noted Sept. 11.

R. I., Providence—HOME—Jewish Home for Aged, c/o J. Hahn, 2 story, basement, brick, stone, to E. Turgeon, 36 Exchange Pl. Est. $150,000. Noted Dec. 4.

Ont., Toronto — MERCANTILE — Robert Simpson Co. Ltd., 176 Yonge St., general contract 6 story, basement, rein.-con. addition, to George A. Fuller Co. of Canada Ltd., McLean Bldg., plumbing and heating, to Purdy-Mansell Co. Ltd., 63 Albert St.; electric wiring, to Canadian Comstock Co. Ltd., 80 King St. W.; sprinklers, to Viking Sprinkler Co. Ltd., Northern Ontario Bldg. Est. $400,000. Noted Dec. 11.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Conn., Higganum — BOTTLING PLANT — Undina Beverage Co., B. A. Benson, vice-pres., sketches 2 story, 75 x 125 ft., brick, timber. $50,000. Private plans.

Ga., Cordele—ICE and COLD STORAGE PLANT—Sawyer Coal & Ice Co., E. J. Sawyer, 6th St., Macon, plans by C. T. Baher, Walton Bldg., Atlanta, 1 story, basement, brick, rein.-con. $75,000.

Ind., East Chicago—PLANT—Inland Steel Co., sketches complete plate strip mill, steel, brick. $5,000,000. Private plans.

Mass., Boston — PRINTING PLANT — City, Dpt. P. Bldgs., printing plant. $300,000 appropriated. Architect not selected.

Minn., LeSueur — CANNING FACTORY — Minnesota Valley Canning Co., canning factory additions, equipment. $200,000. R. W. Richardson, 116 East 4th St., St. Paul, engr.

Minn., Winthrop — CANNING FACTORY — Minnesota Valley Canning Co., LeSueur, canning factory additions, equipment. $200,000. R. W. Richardson, 116 East 4th St., St. Paul, engr.

Mo., Jefferson City—NEWSPAPER PLANT—Jefferson City Post-Tribune, plans by Kennerly & Stiegemeyer, 1111 Title Guaranty Bldg., St. Louis, 3 story, basement, 44 x 120 ft., rein.-con., brick.

N. J., Hoboken—FACTORY—Garsten Realties Co., J. Bonanno, pres., 1827 Bergen Turnpike, North Bergen, 2 story, basement, brick, steel, Madison and Jefferson Sts. between 14th and 15th Sts. $40,000. Private plans. Project in abeyance. Noted Dec. 25.

N. J., Jersey City — MILK DISTRIBUTION PLANT—Sheffield Farms, 524 West 57th St., bids after Feb. 1, general contract milk distribution plant. To exceed $40,000. Noted Dec. 25.

N. J., Newark—FACTORY—Weldon Roberts Rubber Co., 180 Olive St., revised sketches by M. N. Shoemaker, 10 Bleecker St., altering 2 story, basement, brick, steel, 361-65 6th Ave. $40,000. Noted Dec. 8.

N. J., Orange—FACTORY—Owner, c/o A. P. Nucctarone, archt., 206 Central Ave., sketches 3 story, basement, brick, steel, 160-64 South St. $45,000.

N. J., Newark—FACTORY—M. and H. Mehry & Eng. Co., c/o A. Neuschelcler, 40 Clinton St., 2 story, basement, brick, steel, Euclid Ave. and Esther St. $40,0000. Project in abeyance. Architect not selected. Noted Oct. 30.

N. Y., Brooklyn — CHEMICAL PLANT — Novocol Chemical Mfg. Co., M. Nevins, pres., plans by W. A. Lacerenza, 26 Court St., chemical and drug manufacturing plant, Atlantic Ave. and Ashford St. $40,000 incl. equipment.

O., Cleveland—LITHOGRAPHING PLANT— W. M. Powell, archt., Rose Bldg., soon lets contract 3 story, basement, 100 x 132 ft., steel brick, concrete, East 90th and Wigman Sts., for Reserve Lithographing & Printing Co., P. N. Calvert, pres., Caxton Bldg. $150,000.

O., Dayton—FACTORY—Dayton Greenhouse Mfg. Co., 939 South Perry St., plans by Geyer & Scuffer, Ludlow Arcade, 1 and 2 story, basement, 60 x 400 ft., rein.-con., brick, plain found., Miami Chapel Rd., $75,000.

Okla., Okmulgee—FRUIT PACKING PLANT —J. L. Croker, Joplin, Mo., sketches fruit packing plant. $50,000. Private plans.

Pa., Phila.—UPHOLSTERY TEXTILE PLANT —LaFrance Industries, Adams St. above Orthodox St., repairing manufacturing plant damaged by fire. $40,000.

Pa., Pittsburgh—DAIRY—Brazier & Anderson, archts., 309 4th Ave., soon lets contract 2 story, basement, 98 x 160 ft., rein.-con., brick, Reedsdale St., for Corliss Creamery Co., 1762 West Carson St.

Pa., Sharpsville—MANUFACTURING PLANT— Sharpsville Boiler Wks. soon lets contract assembly building for gasoline pumps. To exceed $40,000.

Tenn., Chattanooga—HOSIERY MILLS, etc. —Davenport Hosiery Mills, 906 Georgia Ave., sketches hosiery mills, boiler house, dyeing plant. To exceed $100,000.

Tenn., Kingsport—MANUFACTURING PLANT —Tennessee Eastman Corp., soon lets general contract manufacturing plant. $75,000.

Tex., Fort Worth—STEEL PLANT—Corporation, c/o H. Scullin, c/o Scullin Steel Co., 6700 Manchester St., St. Louis, Mo., sketches by McCrossin & Knapp, 82 Beaver St., New York, steel manufacturing and fabricating plant. $3,000,000.

Tex., San Antonio—ICE and COLD STORAGE PLANT — T. Newton, Court House, and T. Donoghue, 119 Daniel St., ice and cold storage plant, 30 ton capacity. $40,000. Private plans.

Va., Roanoke—MANUFACTURING PLANT —Barrett Co., 40 Rector St., New York, sketches roofing and road building material manufacturing plant. To exceed $100,000.

Vt., Burlington — PRODUCE PLANT — Vermont Fruit Co., B. J. Fayette, rebuilding brick, steel, concrete, plant, recently destroyed by fire, incl. refrigeration storage, Battery and Maple Sts. $100,000. Private plans.

Wash., Seattle—ROOFING FACTORY—A. R. Turner Co., 2325 Iowa Ave., 1 story, 80 x 200 ft. roofing paper manufacturing plant. $65,000.

B. C., Vancouver—PLANT—Standard Gypsum Co. of Canada Ltd., plaster mill. $100,000.

N. B., St. John—FACTORY—International Fertilizer Co., Quebec, Que., plant. $40,000.

N. B., Fredricton—ICE PLANT FACTORY— Syndicate, c/o I. B. McNair-Barrister, artificial ice plant. $50,000.

Ont., Kingston — PLANT — Everlastik Corp., Chelsea, Mass., elastic webbing plant. To exceed $40,000.

Ont., Norland—SAW and PLANING MILL— S. Bryant saw and planing mill. $50,000.

Ont., St. Catherines — FACTORY — Lincoln Fdry. & Machine Wks. Ltd., F. W. Wilson, pres., plant for manufacture hydraulic and dipper dredges.

Ont., Toronto — WOOLEN MILL — Paton & Baldwins, Halifax, Yorkshire, England, and 888 Dupont St., brick, concrete, steel, on 3 acre site in York Twp. $150,000. H. W. Cowan, 129 Adelaide St. W., and owner's own staff, engrs.

Ont., Toronto — CONFECTIONERY CANDY and ICE CREAM PLANT—William Neilson Ltd., 277 Gladstone Ave., sketches 1 story, brick, steel addition. $150,000. Architect not selected.

Que., Levis—PLANT—International Fertilizer Co. plant. $50,000.

BIDS ASKED

Ark., Malvern—ICE PLANT—See "Contracts Awarded."

Conn., Fairfield—DRUG MANUFACTURING PLANT—McKesson & Robbins Co., Grasmere Ave., Fairfield, taking bids general contract rein.-con. addition. $100,000 with equipment. Noted Dec. 4.

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Factories and Mills (Continued)

N. J., Carney's Point (br. Penns Grove) — CHEMICAL—See "Contracts Awarded."

N. J., Jersey City—FACTORY—B. Singer, archt., 921 Bergen Ave., bids about Feb. 15, general contract 2 story, basement, 45 x 140 ft., brick, steel, rein.-con., foot Crawford St., for Jersey City Ladder Co., 677 Montgomery St. Est. $50,000. Noted Aug. 27.

N. Y., Albany—LABORATORY—Feb. 24, by Commissioner Health, State Office Bldg., altering and extending main laboratory, Div. Laboratories & Research. Noted Nov. 6.

N. Y., Brooklyn—PUMP HOUSE—See "Contracts Awarded."

N. Y., Ossining — LAUNDRY — Feb. 19, by Commissioner Correction, State Office Bldg., Albany, laundry and bath building, Sing Sing Prison. Noted Dec. 25.

R. I., Providence — LAUNDRY — Louttit Laundry Co., 307 Broad St., taking bids 2 story, rein.-con., steel, brick laundry. $40,000. L. T. Bohl, 32 Henry St., archt.

CONTRACTS AWARDED

Ark., Malvern—ICE PLANT—Southern Ice & Utilities Co., F. Stroup, genl. mgr., 1 story, 60 x 90 ft., brick, steel, tile, Main and Dyer Sts., local labor, under supervision V. Z. Mitchell, constr. supt. $40,000.

Calif., Los Angeles — PACKING PLANT — Union Packing Co., 3030 East Vernon St., 2 story, basement, 50 x 145 ft., rein.-con., East Vernon Ave., to T. R. Cooper Co., Western Pacific Bldg.

Conn., Bridgeport—FACTORY — Bridgeport Metal Goods Co., Cherry St., 1 story, 60 x 100 ft., brick, mill top addition, to E. & F. Constr. Co., 94 Wells St., $31,850.

Mass., Boston — MANUFACTURING — T. E. Proctor Estate, 201 Devonshire St., altering and remodeling 4 story, basement, 30 x 110 ft., brick, 92 High St., to E. A. Abbott Co., 3 Park St.

Mass., Chelmsford — FACTORY — Southwell Wool Combing Co., North Chelmsford, altering and constructing additions to brick factory, to R. E. Runels Constr. Co., Chalifoux Bldg., Lowell.

Mass., Everett — NITRIC ACID PLANT — Merrimac Chemical Co., plant unit, Chemical Lane, to P. J. MacNaughton & Co., Inc., 711 Boylston St., Boston. $50,000.

N. J., Carney's Point (br. Penns Grove) — CHEMICAL—E. I. duPont deNemours & Co., DuPont Bldg., Wilmington, Del., chemical building, laboratory, ballistic building, smokeless powder plant, day labor and separate contracts, $200,000. DuPont Eng. Co., duPont Bldg., Wilmington, Del., engr.

N. J., Wallington—FACTORY—H. W. Plant & Co., general contract 2 story, basement, 60x80 ft., brick, steel addition, to Mahony Troast Co., Inc., 657 Main Ave., Passaic. Est. $40,000.

N. Y., Brooklyn—PUMP HOUSE—Standard Oil Co. of New Jersey, Kingsland and Norman Aves., pump house, day labor and separate contracts. $40,000. F. H. Klie, 250 Park Ave., New York, archt.

Pa., Braddock — ICE CREAM PLANT — Meyers & Powers Ice Cream Co., 800 6th St., 3 story, 20 x 100 ft., brick, steel, 6th St., to J. Mooney, McKeesport.

Pa., Wilkinsburg — CALORIZING PLANT — Calorizing Co., M. E. Ward, in charge, 400 Hill Ave., 1 story, 80 x 140 ft., steel, Hill St., to Austin Co., Union Trust Bldg., Pittsburgh.

Wis., Menasha—FACTORY—Echl Stationers Corp., general contract 1 story, basement, 75x160 ft., factory, to New London Constr. Co., New London; structural steel, to Wisconsin Bridge Wks., 1410 34th St., Milwaukee; steel sash, to Federal Steel Co., Waukesha; roofing, glazing, to Appleton Roofing Co., Appleton; plumbing and heating, to A. H. Augermayer, Neenah.

Ont., Toronto — PRINTING PLANT — J. A. Thatcher, archt., 37 Cowan Ave., general contract 6 story, basement, steel, stone, for Monetary Times Printing Co. of Canada, 62 Church St., to Anglin-Norcross Ltd., Temple Bldg.; structural steel, to Dominion Bridge Co. Ltd., 1139 Shaw St. Est. $125,000. Noted Dec. 18.

GARAGES

PROPOSED WORK

Conn., Bridgeport — Dugan Bros., Inc., 290 South 5th St., plans by H. Holder, 242 Franklin St., Brooklyn, N. Y., distributing station, service station, garage. $66,000. **Maturity indefinite.**

Ill., Springfield—Illinois Power Co., 314 East Capitol Ave., A. D. Mackie, pres., 1 and 2 story, 150 x 200 ft. garage, incl. gas meter department, Washington St. $150,000. Private plans.

N. J., Jersey City—J. Goldberg, 80 Woodland St., Englewood, new bids about Apr. 1, general contract 4 story, basement, 90 x 150 ft., brick, steel, rein.-con. garage and showroom, Sip and Summit Aves. $250,000. C. Shilowitz, 26 Journal Sq., archt. Noted Oct. 23.

N. Y., Brooklyn—Nanman Building Corp., B. Zisku, pres., 10306 104th St., Richmond Hill, sketches by W. A. Lacerenza, 26 Court St., 100 x 161 ft. service garage and gas station, 86th St. and Avenue W. To exceed $40,000.

N. Y., Brooklyn—Kent Garage Securities Co., 347 Madison Ave., New York, parking garage, $1,500,000. **Maturity in November or later.** H. H. Murdock, 347 Madison Ave., archt. Noted June 12.

N. Y., Brooklyn — One Thousand Four Hundred Eight Pitkin Corp., A. W. Norek, pres., 66 Court St., bids late in fall, general and separate contracts 4 story, service garage, Pitkin and Eastern Parkways. $75,000. H. J. Nurick, 44 Court St., archt. Noted Nov. 6.

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Long Island City—Warner Quinlan Co., 2 Park Ave., New York, bids about April, general contract service garage, Vernon Ave. and 13th St. $180,000. Noted Oct. 9.

N. Y., New York—Sidlo Realty Co., c/o L. Silver, pres., 391 East 149th St., bids about August, general and separate contracts 2 story, basement, 50 x 140 ft. service garage, Webster Ave. and Mosholu Parkway. $40,000. Siegel & Levy, 1775 Bway., archts. Noted Jan. 1.

N. Y., New York—D. Salitino, 1839 Sedgewick Ave., 1 story, 75 x 165 ft. service garage, Sedgewick Ave. and 169th St. $40,000. **Maturity about September.** W. Hohauser, 17 West 44th St., archt. Noted Jan. 1.

R. I., Pawtucket—Frank Cook, Inc., 103 Exchange St., sketches by A. Addeo, 117 Bway., Providence, sales and service garage, North Main St. $50,000.

BIDS ASKED

N. Y., Richmond Hill—Warner Quinlan Co., 2 Park Ave., New York, bids about Apr. 1, general contract 2 story service garage, Vernon Ave. and 44th Rd. $45,000. Noted Oct. 9.

CONTRACTS AWARDED

N. Y., Jamaica—Hickory Homes Corp., c/o H. Dean, archt., Queens Village, 1 story, 100 x 100 ft. service garage, 98th Ave. and 218th St., day labor and separate contracts. **Maturity after Mar. 1.** $40,000. Noted Jan. 1.

N. Y., New York—Allerad Realty Co., 391 East 149th St., 80 x 100 ft. service garage, separate contracts. $40,000. Siegel & Levy, 1775 Bway., archts. Noted Jan. 1.

N. Y., New York—Kenjoyn Realty Corp., K. P. Steinrick, pres., 362 West 23rd St., bids late in July, general and separate contracts service garage, 435 West 25th St. $400,000. L. E. Dell, Bogota, N. J., archt. Noted Jan. 8.

POWER PLANTS

PROPOSED WORK

Calif., Turlock—See "Excavation, Drainage, Irrigation, Levees and Harbors."

Okla., Hominy—City bids in February concrete brick power plant. $150,000. V. V. Long & Co., 1300 Colcord Bldg., Oklahoma City, engrs. Noted Dec. 4.

Okla., Pawhuska—City, additional 600 hp. Diesel engine for municipal electric plant. $50,000. S. P. Malone, Pawhuska, engr.

Tex., El Paso—El Paso Electric Co., Martin Bldg., improving electric and power plant, incl. dynamo unit, equipment, machinery, $150,000. Private plans.

Tex., San Antonio—San Antonio Pub. Serv. Co., North St. Mary's St., changing sub-station equipment, incl. new power equipment, enlarging sub-stations, $500,000. E. H. Kifer, c/o owner, engr.

BIDS ASKED

Tex., Marble Falls—Jan. 29, by Emery, Peck & Rockwood Development Co., power house, $1,400,000; 9,000 ft. power dam on Colorado River, $2,000,000. Private plans. Noted Sept. 4 under "Dams."

CONTRACTS AWARDED

Ariz., Phoenix — Central Arizona Light & Power Co., 300 West Washington St., building for substation, to C. Campbell, 90 West Moreland St., $52,000.

Ia., Independence—City, c/o C. L. King, clk., 600-675 B. Hp. Diesel engine, and Allis-Chalmers alternating current generator, to Worthington Pump & Mchy. Co., Clinton and Roberts Sts., Buffalo, N. Y., $39,985; two 20,000 gal. fuel oil tanks, to Morrison Bros., Dubuque, at $1,408.

Pa., Safe Harbor—Safe Harbor Water Power Co., 4 generators for hydro-electric plant on Susquehanna River, 8 mi. above Holtwood Dam, to General Electric Co., Schenectady, N. Y.; 2 generators, to Westinghouse Electric Mfg. Co., 150 Bway., New York. Noted Oct. 31, 1929, under "Contracts Awarded."

SHOPS AND FOUNDRIES

BIDS ASKED

Calif., Richmond—SHOPS—Atchison, Topeka & Santa Fe R. R. Co., M. C. Blanchard, ch. engr. (Coast lines) Kerckhoff Bldg., 6th and Main Sts., Los Angeles, taking bids 1 story, steel, brick shops.

N. Y., Napanoch—INDUSTRIAL—Feb. 19, by Dpt. Correction, Albany, store house and industrial shop, Institution for Defective Delinquents. Noted Dec. 25.

WAREHOUSES

PROPOSED WORK

Calif., San Francisco—California State Harbor Comn., Ferry Bldg., 150 x 800 ft., steel, concrete shed and bulkhead building, Pier 15. $125,000. F. G. White, Ferry Bldg., engr.

Ky., Lexington—American Suppliers, Inc., subsidiary American Tobacco Co., 111 5th Ave., New York, warehouse, $500,000. **Maturity late in March.** Noted Jan. 15.

Mass., Boston—Standard Oil Company of New York, Park Square Bldg., 95 m.g. bulk storage oil storage plant near Saratoga St. To exceed $40,000. Private plans.

Neb., Lincoln—Omaha, Lincoln & Beatrice R.R. Co., G. P. Abel, pres., 234 South 14th St., brick, concrete terminal warehouse, 150 x 375 ft., me, 19th and Y Sts. $250,000.

N. J., Hackensack—Standard Oil Co. of New Jersey, M. Lindsay, in charge, 26 Bway., New York, soon let contract, 40 x 80 ft. warehouse, 112 x 120 ft. office and garage, 17 x 23 ft. foam pump house, 17 x 42 ft. oil pump house, 15 x 20 ft. can filling building, two 8 x 10 ft. hose houses, all 1 story, on Hackensack River front. $150,000. Private plans. Noted Jan. 8.

N. Y., New Brighton (mail Staten Island)—W. P. Tanner & Gross, 25 Beaver St., New York, bids late in summer, general contract 7 story, basement, brick, steel, rein.-con. storage and warehouse, plain found. To exceed $150,000. Noted July 10.

N. Y., New York—Lincoln Warehouse Corp., 1187 3rd Ave., bids late in March, 14 story warehouse, bank, office, 20 East 69th St. $500,000. G. S. Kingsley, 103 East 125th St., archt. Noted Jan. 8.

N. Y., New York—Star Co., 220 South St., will let general contract about Feb. 1, 3 story warehouse and industrial building, 419 Water St. and 95 Market St. $175,000. No more bids to be taken. Lockwood, Greene & Co., 100 East 42nd St., archts. Noted Jan. 8.

N. Y., White Plains—New York, Westchester & Boston R.R. Co., I. M. Beard, ch. engr., 481 Morris Park Ave., New York, warehouse, terminal facilities, Westchester Ave. Terminal. $1,000,000. **Maturity in fall.** Noted June 4.

O., North Bend — Gulf Refining Co., Frick Bldg., Pittsburgh, Pa., soon lets contract rail and water oil distribution and storage building. To exceed $40,000.

BIDS ASKED

N. J., Perth Amboy—Ballinger & Co., archts., 12th and Chestnut Sts., Phila., Pa., bids about Mar. 15, general contract 1 story, basement, brick, steel, rein.-con. warehouse, Fayette and Reade Sts., for Greenspan Bros., 226 Washington St. Est. $150,000. Noted Jan. 8.

N. Y., New York—E. W. Wade, 1 Liberty St., bids about July 1, general contract 14 story, 100 x 123 ft. furniture storage, 303 East 39th St. $500,000. G. S. Kingsley, 103 East 125th St., archt. Noted Sept. 8 Daily.

Pa., Pittsburgh — H. J. Lohrey Co. (meat packers) W. G. Lohrey, in charge, 2232 East St., taking bids 4 story, 50 x 50 ft., brick, concrete refrigeration warehouse, 2234 East St. Private plans.

CONTRACTS AWARDED

Ill., Chicago—Chicago, Burlington & Quincy R.R. Co., 547 West Jackson Blvd., A. W. Newton, ton ch. engr., superstructure 2 story, 310 ft. long, and 1 story, 625 ft. long, brick, stone (express terminal) covered tracks and platforms, railroad, Roosevelt Rd., Taylor and Canal Sts., to J. B. French Co., 30 North Michigan Ave., plumbing, sewers, fire protection, to Federal Eng. Co., 3240 South Michigan Ave., heating, to Kohlbry-Howlett Co., 63 West Ontario St. Est. $650,000.

Wis., Milwaukee—Terminal Warehouse Co., 106 Seeboth St., general contract 5 story, 62x120 ft. cold storage warehouse, to P. Riesen's Sons Co., 2660 North Humboldt Ave.; sublet plastering to Edmund Odya, 4421 North Frederic Ave.; sheet metal, to Biersoch & Niedermeyer Co., 661 Hubbard Ave.; steel, to W. F. Eichfeld & Son, East Pittsburgh and Barclay Sts.; plumbing, to Dahl Plumbing Co., 1613 State St.; roofing, to Winding Roofing Co., 68 East Wisconsin Ave.; glass, to Pittsburg Plate Glass Co., 205 Pittsburg Ave.; reinforcing steel, to Worden Allen Co., Port Washington Rd.; painting, to A. F. Schieble, 1970 21st St. Noted Dec. 4.

Ont., Fort William—Canadian Natl. Rys., C. S. Zowski, ch. engr. constr., McGill St., Montreal, Que., general contract 60 x 900 ft. wood, metal freight building, pile found., to B. W. Graham & Sons, Moosejaw, Sask. Est. $150,000.

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See proposal advertising on page 104